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ART. I. *An Experimental Enquiry into the Modes of warming and ventilating Apartments.* By ANDREW URE, M.D. F.R.S., &c. Read before the Royal Society on the 16th of June, 1836. Communicated by the Author.

THE subjects of warming and ventilating apartments, in reference to the comfort and health of their inmates, have lately excited a great deal of attention. The commissioners delegated by government to enquire into the circumstances of factory labour adverted in their reports to some of the expedients employed for ventilating certain cotton mills; and, more recently, a select committee of the House of Commons has considered and reported upon the best mode of ventilating and warming the new Houses of Parliament. In an extensive tour which I made, during the two preceding seasons, through England, France, and Belgium, to investigate the applications of chemical and mechanical science to manufactures, I paid particular attention to these subjects, so interesting to science, as well as humanity; and I have had my mind professionally turned to them by the Directors of the Customs Fund of Life Assurance, on account of the very general state of indisposition and disease prevailing among those of their officers (nearly 200 in number) engaged on duty in the Long Room of the Custom House, London. I now respectfully submit the result of my observations and experiments on these points of public interest to the Royal Society.

The symptoms of disorder experienced by the several gentlemen (about twenty in number), whom I examined out of a great many who were indisposed, were of a very uniform character. The following is the result of my researches: —

A sense of tension or fulness in the head, with occasional flushings of the countenance, throbbing of the temples, and vertigo, followed, not unfrequently, with a confusion of ideas,

very disagreeable to officers occupied with important, and sometimes intricate, calculations. A few are affected with unpleasant perspiration on their sides. The whole of them complain of a remarkable coldness and languor in their extremities, more especially the legs and feet, which has become habitual, denoting languid circulation in these parts, which requires to be counteracted by the application of warm flannels on going to bed. The pulse is, in many cases, more feeble, frequent, sharp, and irritable than it ought to be, according to the natural constitution of the individuals. The sensations in the head occasionally rise to such a height, notwithstanding the most temperate regimen of life, as to require cupping, and at other times depletory remedies. Costiveness, though not a uniform, is yet a prevailing symptom.

The sameness of the above ailments, in upwards of one hundred gentlemen, at very various periods of life, and of various temperaments, indicates clearly sameness in the cause.

The temperature of the air in the Long Room ranged, in the three days of my experimental inquiry, from 62° to 64° of Fahrenheit's scale; and in the Examiner's Room it was about 60°, being kept somewhat lower by the occasional shutting of the hot-air valve, which is here placed under the control of the gentlemen; whereas that of the Long Room is designed to be regulated in the sunk story, by the fireman of the stove, who seems sufficiently careful to maintain an equable temperature amidst all the vicissitudes of our winter weather. Upon the 7th of January, the temperature of the open air was 50°; and on the 11th it was only 35°; yet upon both days the thermometer in the Long Room indicated the same heat of from 62° to 64°.

The hot air discharged from the two cylindrical stove-tunnels into the Long Room was at 90° upon the 7th, and at 110° upon the 11th. This air is diluted, however, and disguised by admixture with a column of cold air before it is allowed to escape. The air, on the contrary, which heats the Examiner's Room undergoes no such mollification, and comes forth at once in an ardent blast of fully 170°; not unlike the simoom of the desert, as described by travellers. Had a similar nuisance, on the greater scale, existed in the Long Room, it could not have been endured by the merchants and other visiters on business: but the disguise of an evil is a very different thing from its removal. The direct air of the stove, as it enters the Examiner's Room, possesses, in an eminent degree, the disagreeable smell and flavour imparted to air by the action of red-hot iron; and, in spite of every attention on the part of the fireman to sweep the stove apparatus from time to time, it carries along with it abundance of burned dusty particles.

The leading characteristic of the air in these two rooms

is its dryness and disagreeable smell. In the Long Room, upon the 11th, the air indicated, by Daniell's hygrometer, 70 per cent of dryness, while the external atmosphere was nearly saturated with moisture. The thermometer connected with the dark bulb of that instrument stood at 30° when dew began to be deposited upon it; while the thermometer in the air stood at 64°. In the court behind the Custom-house, the external air being at 35°, dew was deposited on the dark bulb of the hygrometer by a depression of only 3°; whereas in the Long Room, on the same day, a depression of 34° was required to produce that deposition. Air, in such a dry state, would evaporate 0·44 in. depth of water from a cistern in the course of twenty-four hours; and its influence on the cutaneous exhalents must be proportionably great.

As cast iron always contains, besides the metal itself, more or less carbon, sulphur, phosphorus, or even arsenic, it is possible that the smell of air passed over it in an incandescent state may be owing to some of these impregnations; for a quantity of noxious effluvia, inappreciably small, is capable of affecting not only the olfactory nerves, but the pulmonary organs. I endeavoured to test the air as it issued from the valve in the Examiner's Room, by presenting to it pieces of white paper moistened with a solution of nitrate of silver, and perceived a slight darkening to take place, as if by sulphurous fumes. White paper, moistened with sulphuretted hydrogen water, was not in the least discoloured. The faint impression on the first test paper may be, probably, ascribed to sulphurous fumes, proceeding from the ignition of the myriads of animal and vegetable matters which continually float in the atmosphere, as may be seen in the sunbeam admitted into a dark chamber: to this cause, likewise, the offensive smell of air, transmitted over red-hot iron, may, in some measure, be attributed, as well as to the hydrogen resulting from the decomposition of aqueous vapour, always present in our atmosphere in abundance; especially close to the banks of the Thames, below London Bridge.

When a column of air sweeps furiously across the burning deserts of Africa and Arabia, constituting the phenomenon called simoom by the natives, the air becomes not only very hot and dry, but highly electrical, as is evinced by lightning and thunder. Dry sands, devoid of vegetation, cannot be conceived to communicate any noxious gas or vapour to the atmosphere, like the malaria of marshes, called miasmata: it is, hence, highly probable that the blast of the simoom owes its deadly malignity, in reference to animal as well as vegetable life, simply to extreme heat, dryness, and electrical disturbance. Similar conditions, though on a smaller scale, exist in what is called the bell, or cockle, apparatus for heating the Long Room and the Exami-

ner's apartment in the Custom-house. It consists of a series of inverted, hollow, flattened pyramids of cast iron, with an oblong base, rather small in their dimensions, to do their work sufficiently in cold weather when moderately heated. The inside of the pyramids is exposed to the flames of coke furnaces, which heat them frequently to incandescence, while currents of cold air are directed to their exterior surfaces by numerous sheet-iron channels. The incandescence of these pyramids, or bells, as they are vulgarly called, was proved by pieces of paper taking fire when I laid them on the summits. Again, since air becomes electrical when it is rapidly blown upon the surfaces of certain bodies, it occurred to me that the air which escapes into the Examiner's Room might be in this predicament. It certainly excites the sensation of a cobweb playing round the head, which is well known to all who are familiar with electrical machines. To determine this point, I presented a condensing gold-leaf electrometer to the said current of hot air, and obtained faint divergence, with negative electricity. The electricity must be impaired in its tension, however, in consequence of the air escaping through an iron grating, and striking against the flat iron valves, both of which will tend to restore the electric equilibrium. The air blast, moreover, by being diffused round the glass of the condenser apparatus, would somewhat mask the appearances. Were it worth while, an apparatus might be readily constructed for determining this point, without any such sources of fallacy. The influence of an atmosphere charged with electricity in exciting headach and confusion of thought in many persons, is universally known.

The fetid burned odour of the stove air, and its excessive avidity for moisture, are of themselves, however, sufficient causes of the general indisposition produced among the gentlemen who are permanently exposed to it in the discharge of their public duties.

From there being nearly a vacuum, as to aqueous vapour, in the said air, while there is nearly a plenum in the external atmosphere round about the Custom-house, the vicissitudes of feeling in those who have occasion to go out and in frequently must be highly detrimental to health. The permanent action of an artificially desiccated air on the animal economy may be stated as follows: —

The living body is continually emitting a transpirable matter, the quantity of which, in a grown up man, will depend partly on the activity of the cutaneous exhalents, and partly on the relative dryness or moisture of the circumambient medium. Its average amount, in common circumstances, has been estimated at 20 ounces in twenty-four hours.

When plunged in a very dry air, the insensible perspiration

will be increased; and, as it is a true evaporation or gasefaction, it will generate cold proportionably to its amount. Those parts of the body which are most insulated in the air, and furthest from the heart, such as the extremities, will feel this refrigerating influence most powerfully. Hence the coldness of the hands and feet, so generally felt by the inmates of the apartment, though its temperature be at or above 60°. The brain, being screened by the skull from this evaporating influence, will remain relatively hot, and will get surcharged, besides, with the fluids which are repelled from the extremities by the condensation, or contraction, of the blood-vessels caused by cold. Hence the affections of the head, such as tension, and its dangerous consequences. If sensible perspiration happen, from debility, to break forth from a system previously relaxed, and plunged into dry air, so attractive of vapour, it will be of the kind called a cold clammy sweat on the sides and back, as experienced by many inmates of the Long Room.

Such, in my humble apprehension, is a rationale of the phenomena observed at the Custom-house. Similar effects have resulted from hot-air stoves of a similar kind in many other situations.

After the most mature physical and medical investigation, I am of opinion that the circumstances above specified cannot act permanently upon human beings, without impairing their constitutions, and reducing the value of their lives. The Directors of the Customs Fund are therefore justified in their apprehensions, "that the mode of heating the Long Room is injurious to the health of persons employed therein, and that it must unduly shorten the duration of life."

It is evident, moreover, that the public service must suffer serious inconvenience in consequence of so many revenue officers, of great experience in business, being constantly exposed to the influence of a cause under which the most perspicacious intellect may become confused, and the most vigorous frame may be frequently disqualified for the discharge of a daily recurring duty. In fact, the absences among the officers of the Long Room in consequence of indisposition must be detrimental to the service, and may, for the most part, be traced to the malaria of the stoves.

For the purpose of producing a comfortable temperature in the air of the rooms occupied by individuals of a sedentary calling, like the in-door officers of His Majesty's Customs, cast-iron pipes, circulating steam a few degrees above the 212th degree of Fahrenheit's scale, should be distributed along the floor, close to the line of desks within which the officers sit. A corresponding range of small orifices should be made in the lower

part of the desk partitions, for permitting the free ingress of the warm air around their limbs; and a series of sliding plates should be attached, for regulating these orifices, so as to enable each individual to suit the supply of warmth to his peculiar feelings and constitution. Self-acting register valves should, at the same time, be fixed aloft in the Long Room, which would regulate the discharge of foul air, and maintain a wholesome ventilation in the air below.

Nothing can be more preposterous, in an economical and scientific point of view, than the mode of introducing the hot air into the Long Room, through two wide vertical tunnels in the line of its centre, whence it rises rapidly to the lofty roof, and can communicate warmth to the inmates, seated near the floor, only by reverberating downwards in a polluted state of mixture, with many cutaneous and pulmonary exhalations. Whereas the great principle of ventilation is, never to present the same portion of air twice over to the human lungs, but to supply them at each fresh inspiration with pure aerial particles, in a genial thermometric and hygrometric condition. Such air should be poured in, rightly prepared, from innumerable orifices in or near the floor, and pass up over the living frames, never to be thrown back upon them, but to be discharged through an equivalent number of orifices in the ceiling, too small to permit a counter current of cold air downwards. By such ceaseless circulation, comfort and health would be permanently secured, at probably one fourth part of the expenditure of fuel now consumed in corrupting the aerial element, and in placing many valuable lives in jeopardy.

In the recent report of the Parliamentary Committee, it is truly surprising that not a syllable is said about the methods of warming and ventilating apartments employed in the factories, although they afford unquestionably the best models for imitation, being the results of innumerable experiments made on a magnificent scale, with all the lights of science, and all the resources of our ablest civil engineers.

The warming is effected by horizontal ranges of cast-iron steam-pipes, properly supported or suspended, so as to give free play to their expansion and contraction from alternations of temperature, as well as to secure the equable distribution of low-pressure steam, and the ready efflux of the water of condensation. There cannot be a single doubt of this system being the only one which can, with safety, certainty, and economy, be used in preparing in one or more antechambers a body of genial air, to be thereafter diffused through the Houses of Parliament and their subordinate committee rooms. The only point which can admit of discussion is, the mode of renewing the atmosphere, or what is commonly called ventilation. In this respect, also, the

engineers of the metropolis will find themselves outstripped by those of Manchester, and some other factory districts.

Various schemes were resorted to, at the suggestion of several ingenious projectors, for ventilating the old House of Lords. Two, at least, of the plans consisted in the erection of a stove furnace in a chamber over that house, and in drawing the air for the supply of that furnace from the apartment below, so as to suck out the foul and hot atmosphere accumulated under its ceiling. The ventilating power of such an apparatus would be proportional to the quantity of fuel consumed, and the rapidity of its combustion; both being dependent, of course, upon the height of the chimney. It is well known that the contrivance was quite inefficient to refresh the air when it was most wanted; namely, when the house was crowded.

The quantity of air discharged in a given time by chimney draughts does not seem to have been hitherto made the subject of very accurate experiments. Whenever a certain volume of air is heated from the freezing to the boiling point of water, it expands into one volume and three eighths; and it therefore tends to rise up with a force equal to the difference between the weight of the volume of the cold air, whose space it now occupies, and its own weight; that is, in the present case, the difference between one and three eighths, and one; or 11 and 8.

Let us suppose a chimney, 50 yards high, to be supplied constantly at the bottom with air heated to 212°, while the external atmosphere is 32° Fahr. The tunnel, being full of the hot air, its ascensional force will be obviously the difference between the weights of two columns of air, each 50 yards high, the one at the boiling, and the other at the freezing, temperature of water: the force will, likewise, be the same as that acting in a siphon filled with air, and having one of its arms longer than the other, by the difference between the bulk of the cold and the hot air. This columnar difference of weight is the sole cause of the movement; and it is well known, both by theory and experiment, that the velocity of discharge through this columnar difference, which, in the present case, is $18\frac{3}{4}$ yards, would be equal to the velocity which a solid body would acquire in falling freely from that height. But a body falling from the height of $56\frac{1}{4}$ ft. would pass through 60 ft. per second, which is the velocity of efflux sought. A small deduction ought to be made from this number, on account of the increased density of the burned air in chimneys, in consequence of the replacement of a portion of its oxygen by carbonic acid.

The density of burned air, as it issues from chimney-tops, compared with that of atmospheric air of the same temperature, may be reckoned as $104\frac{1}{2}$ to 100. In practice, it will be found convenient to make the calculations as if the air were chemically

the same, and to multiply the velocity found by 0·97; which would reduce the above 60 ft. to 58·2 ft.

Such are the results of theory; but they vary considerably from practice, in consequence of the varying lengths and forms of the chimney, which change the velocity of the aerial currents by friction, refrigeration, &c. In high chimneys of wrought iron, like those of steam-boats, the refrigeration is considerable, and causes a diminution of velocity far greater than what occurs in a factory stalk of well-built brickwork. In comparing the numbers resulting from the trials made on chimneys of different materials and of different forms, it has been concluded that the obstruction to the draught of the air, or the deduction to be made from the theoretical velocity of efflux, is directly proportional to the length of the chimneys and to the square of the velocity, and inversely to their diameter. With an ordinary wrought-iron pipe, of from 4 in. to 5 in. diameter, attached to an ordinary stove burning good charcoal, the difference is prodigious between the velocity calculated by the above theoretical rule, and that observed by means of a stop-watch, and the ascent of a puff of smoke from a little tow, dipped in oil of turpentine, thrust quickly into the fire. The chimney being 45 ft. high, the temperature of the atmosphere 68° Fahr., the velocity per second was, —

Trials.	By Theory.	By Experiment.	Mean Temperature of Chimney.
1	26·4 feet	5 feet.	190° Fahr.
2	29·4	5·76	214°
3	34·5	6·3	270°

To obtain congruity between calculation and experiment, several circumstances must be introduced into our formulæ. In the first place, the theoretical velocity must be multiplied by a factor, which is different according as the chimney is made of bricks, pottery, sheet iron, or cast iron. This factor must be multiplied by the square root of the diameter of the chimney (supposed to be round), divided by its length, increased by four times its diameter. Thus, for pottery, its expression is $2{\cdot}06\sqrt{\frac{D}{L+D}}$; D being the diameter, and L the length, of the chimney.

A pottery chimney, 33 ft. high, and 7 in. in diameter, when the excess of its mean temperature above that of the atmosphere was 205° Fahr., had a pressure of hot air equal to 11·7 ft., and a velocity of 7·2 ft. per second. By calculating from the last formula, the same number very nearly is obtained. In none of the experiments did the velocity exceed 12 ft. per second, when the difference of temperature was more than 410° Fahr.

Every different form of chimney would require a special set of experiments to be made for determining the proper factor to be used.

This troublesome operation may be saved by the judicious application of a delicate differential barometer, such as that invented by Dr. Wollaston; though this instrument does not seem to have been applied by its very ingenious author in measuring the draughts or ventilating powers of furnaces.

If into one leg of this differential siphon, water be put, and fine spermaceti oil into the other, we shall have two liquids, which are to each other in density as the numbers 8 and 7. If proof spirit be employed instead of water, we shall then have the relation of very nearly 20 to 19. I have made experiments on furnace draughts with the instrument in each of these states, and find the water and oil siphon to be sufficiently sensible: for the weaker draughts of common fireplaces the spirits and oil will be preferable barometric fluids.

To the lateral projecting tube of the instrument, as described by Dr. Wollaston, I found it necessary to attach a stopcock, in order to cut off the action of the chimney, while placing the siphon, to allow of its being fixed in a proper state of adjustment, with its junction line of the oil and water at the zero of the scale. Since a slight deviation of the legs of the siphon from the perpendicular changes very considerably the line of the level, this adjustment should be made secure by fixing the horizontal pipe tightly into a round hole bored into the chimney-stalk, or drilled through the furnace door. On gently turning the stopcock, the difference of atmospherical pressure, corresponding to the chimney draught, will be immediately indicated by the ascent of the junction-line of the liquids in the siphon. This modification of apparatus permits the experiment to be readily rectified by again shutting off the draught, when the air will slowly re-enter the siphon; because the projecting tube of the barometer is thrust into the stopcock, but not hermetically joined; whereby its junction line is allowed to return to the zero of the scale in the course of a few seconds.

Out of many experiments made with this instrument, I shall content myself with describing a few, very carefully performed at the breweries of Messrs. Truman, Hanbury, and Buxton, and of Sir H. Meux, Bart., and at the machine factory of Messrs. Braithwaite; in the latter of which I was assisted by Captain Ericsson. In the first trials at the breweries, the end of the stopcock attached to the differential barometer was lapped round with hemp, and made fast into the circular peep-hole of the furnace door of a wort copper, communicating with two upright parallel chimneys, each 18 in. square, and 50 ft. high. The fire was burning with fully its average intensity at the time. The adjustment of the level being perfect, the stopcock orifice was opened, and the junction level of the oil and water rose steadily, and stood at $1\frac{1}{4}$ in., corresponding to $\frac{1{\cdot}25}{8} = 0{\cdot}156$ of 1 in.

of water, or a column of air 10·7 ft. high. This difference of pressure indicates a velocity of 26 ft. per second. In a second set of experiments, the extremity of the stopcock was inserted into a hole bored through the chimney-stalk of the boiler of a Boulton and Watt steam-engine of twenty horses' power. The area of this chimney was exactly 18 in. square at the level of the bored hole, and its summit rose 50 ft. above it. The fire-grate was about 10 ft. below that level. On opening the stopcock, the junction line rose 2¼ in. This experiment was verified by repetition on different days, with fires burning at their average intensity, and consuming fully 12 lb. of the best coals hourly for each horse's power, or nearly one ton and a third in twelve hours. If we divide the number 2¼ by 8, the quotient 0·28 will represent the fractional part of 1 in. of water, supported in the siphon by the unbalanced pressure of the atmosphere in the said chimney; which corresponds to 19¼ ft. of air, and indicates a velocity in the chimney current of 35 ft per second. The consumption of fuel was much more considerable in the immense grate under the wort copper, than it was under the steam-engine boiler.

In my experiments at Messrs. Braithwaite's factory, the maximum displacement of the junction line was 1 in., when the differential oil and water barometer was placed in direct communication with a chimney 15 in. square, belonging to a steam boiler, and when the fire was made to burn so fiercely, that, on opening the safety-valve of the boiler, the excess of steam beyond the consumption of the engine rushed out with such violence as to fill the whole premises. The pressure of one eighth of an inch of water denotes a velocity of draught of 23·4 ft. per second.

The differential barometer was next attached to the suction-chamber of a ventilator fan, used for drawing the air through the fireplace, in the ingenious steam boiler of Messrs. Braithwaite and Ericsson's patent construction. The result was remarkable. Here the draught was so great, that it became necessary to remove the oil, and to employ merely a water siphon. When the speed of the circumference of the revolving vanes was 120 ft. per second, the suction was sufficient to support steadily 2 in. of water. This aqueous column, however, indicates a velocity of only 94 ft. per second, instead of 120. The pressure of air equivalent to this velocity is 224 vertical feet; equal to a column of water 3¼ in. high. But we must consider that the true velocity of the impelling points of the vanes is only seven eighths of the velocity of their tips, or 105 ft. per second. If this circumstance be not taken into account, we should be led to infer that, in an eccentric ventilator of the best centrifugal form, so much air escapes, by inertia, between the vanes and the

sides of the box in which they revolve, as to cause a loss of nearly one fourth of velocity in the issuing current. Every principle of physics forbids us to suppose, as some engineers have hastily done, that the siphon pressure indicates only three fourths of the effects of the current upon the atmospheric equilibrium. On this point we shall presently offer some other illustrations.

When the wings of the fan were made to revolve with a velocity of 180 ft. per second, by connecting its rigger band with a larger driving pulley, the difference of water level in the two legs of the siphon amounted to only 3 in.; an unbalanced pressure, which indicates a velocity of efflux in the air of only 115 ft. per second, and a defalcation of effect, therefore, tantamount to 30 per cent, which is evidently due to the greater effect of inertia at that degree of speed; the effective velocity of the vanes being taken, as formerly, at seven eighths of that of their extremities.

In a third set of experiments, when the extremities of the vanes revolved with a velocity of 80 ft. per second, the water stood 1 in. higher in the one leg of the siphon than in the other. This difference of level indicates a velocity of 66 ft. per second. Here the loss of velocity, from the inertia and the eddies of the lateral portions of air, is only 6 per cent upon the effective velocity.

The following table exhibits the velocities of the air corresponding to different altitudes of the differential water barometer: —

12 inches of water correspond to a velocity of	231 feet per second.
6	163
3	115
2	94
$1\frac{1}{2}$	81
1	66
$\frac{1}{2}$	47
$\frac{1}{4}$	33
$\frac{1}{9}$	25
$\frac{1}{8}$ = 1 in. of the water-oil siphon	23·4

It has been ascertained, that a power equivalent to one horse, in a steam-engine, will drive, at the rate of 80 ft. per second, a fan the effective surfaces of whose vanes, and whose inhaling conduits, have each an area of 18 in. square, equal to that of the steam-boiler chimney mentioned above. The velocity of air in the chimney, produced by a consumption of fuel equivalent to the power of twenty horses, was no more than 35 ft. per second; while that of the fan, as impelled by the power of one horse, was 66 ft. per second. Hence it appears, that the economy of ventilation by the fan is to that by the chimney draught as 66 is to $\frac{35}{20}$, or as 38 to 1. It is obvious, therefore, that, with one bushel or ton of coals consumed in working a steam-impelled eccentric fan,

we can obtain as great a degree of ventilation, or we can displace as great a body of air, as we could with 38 bushels or tons of coals consumed in creating a chimney draught. Economy, cleanliness, and compactness of construction are not, however, the sole advantages which the mechanical system of ventilation possesses over the physical. It is infallible, even under such vicissitudes of wind and weather as would essentially obstruct any chimney-draught ventilation, because it discharges the air with a momentum quite eddy-proof, and it may be increased, diminished, or stopped altogether, in the twinkling of an eye, by the mere shifting of a band from one pulley to another, as is practised upon all spinning-machines. No state of atmosphere without, no humidity of air within, can resist its power. It will expel the air of a crowded room, loaded with the vesicular vapours of perspiration, with equal certainty as the driest and most expansive.

The preference due to the mechanical system may be made popularly plain, by considering how little power could be obtained by applying a chimney current to impel machinery, through the agency of the best-going smoke-jack, or any other analogous construction. It is clear that the consumption of fuel, applied through the medium of steam, which produces the power of twenty horses in the above steam-engine, would, by the impulsion of an ascending current of air upon any mechanism, barely do the work of half a horse.

In an analogous experiment made at the brewery of Messrs. Truman, Hanbury, and Buxton, the differential barometer being placed in communication, as above described, with the chimney-stalk of the steam-engine boiler, suffered a change of level in the junction line of oil and water of $2\frac{1}{4}$ in., equivalent, as before, to 0·28 of 1 in. of water. The chimney had an area of 16 in. by 18 in. at the point where the lateral tube of the barometer was inserted, and it rose 50 ft. above that point.

About 12 lb. of coal were consumed hourly for each horse power, and steam corresponding to the power of fifteen horses, at least, was generated in each boiler. Hence it would appear, that from 180 lb. to 200 lb. of coals were burned hourly to maintain a chimney current of 35 ft. per second, or a discharge of air of 70 cubic feet in that time. This result agrees as nearly with that obtained at Sir Henry Meux's brewery as can be expected in experiments of this nature. The coal employed in the latter establishment is of the excellent Welch quality called Llangennech, which burns without smoke. Were other proprietors of great manufactories to imitate this patriotic example, one of the worst nuisances of London would be abated.

The value of fans to sweeten the atmosphere is beginning to be fully appreciated in the factories, more especially in the

power-loom apartments, where several hundred persons are congregated together in a moderate space. The beneficial mode of mounting them, with this view, described in the *Philosophy of Manufactures* has been instrumental in drawing the attention of manufacturers to so simple and efficacious a means of promoting the health of their work-people. In these circumstances, it will appear somewhat surprising that none of the members of the late Parliamentary Committee, nor any of the scientific gentlemen whom they examined, should have made the slightest allusion to mechanical ventilation. This omission will appear the more remarkable, since a celebrated member of the Royal Society, Dr. Desaguliers, one hundred years ago, applied a similar invention, as he says, "to the clearing the House of Commons of foul air." The following paragraph of his memoir deserves peculiar notice, as it shows with what a roundabout of futile expedients the public has been deluded for a century past: —

"In the year 1736," says the doctor, "Sir George Beaumont, and several other members of the House of Commons, observing that the design of cooling the House by the fire machines above described (like the pumping stoves of the Marquis de Chabannes in our day) was frustrated, asked me if I could not find some contrivance to draw the hot and foul air out of the House, by means of some person that should entirely depend upon me; which, when I promised to do, a committee was appointed to order me to make such a machine, which, accordingly, I effected, calling the wheel a centrifugal, or blowing-wheel, and the man that turned it a ventilator. This wheel, though in some things like Papin's Hessian bellows, differs much from it, being more effectual and able to suck out the foul air, or throw in fresh, according as the Speaker pleased to command it; whose order the ventilator waits to receive every day of the session, the wheel being still in use."

The wheel is described as being 7 ft. in diameter, 1 ft. broad, as taking in air at its centre, and revolving concentrically with its case. It was worked, at least occasionally, from the year 1736 down to the year 1743, when the first edition of the *Experimental Philosophy* of Desaguliers was published. The machine probably remained in the chamber over the House of Commons, and fell a victim to the fire which lately consumed that time-honoured edifice.

As the ventilating fan of Desaguliers was worked by a man turning a winch, it could not have made more than forty revolutions in a minute, whence the mean speed of the tips of its vanes could not have exceeded 15 ft. in a second. In considering, therefore, the defectiveness of its construction, as well as the small area of its discharge-pipe, it was, probably, not misnamed

"a philosophical toy" by Sir Jacob Ackworth, then First Lord of the Admiralty, who went down to Woolwich to see its performance in ventilating the hold of His Majesty's ship the Kinsale.

It does not appear that, since the time of Desaguliers, the ventilating fan has been subjected to scientific experiment and examination; for M. Pouillet, a distinguished French philosopher, described last year, in the sixth livraison of his *Portefeuille Industriel*, with high but unmerited commendations, a fan erected at Rouen for blowing a foundery cupola, which, on trial, was quite inefficient in propelling the air, while it shook the floor where it stood with tremendous violence. This fan is of the concentric construction, and must, therefore, expend the chief part of the power applied to drive it, in carrying the air round with its vanes, instead of throwing it off at the discharge-pipe. The English Company of Machine-makers settled at Rouen, to whom it belongs, have been obliged to alter it after the plan now commonly adopted in Lancashire.

The following sketches (*figs.* 19. to 22.) and experimental illustrations will, I hope, throw some light upon the operations of a ventilating fan.

Fig. 19. is intended to show, by the course of the lines traced

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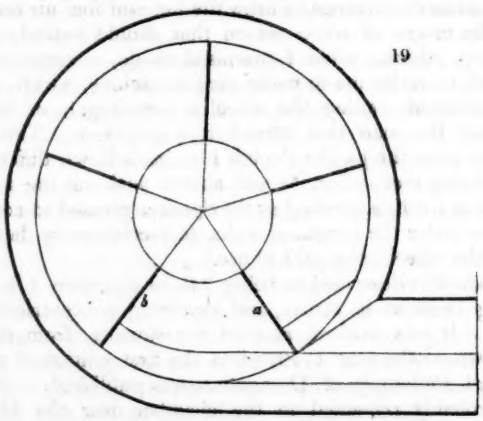
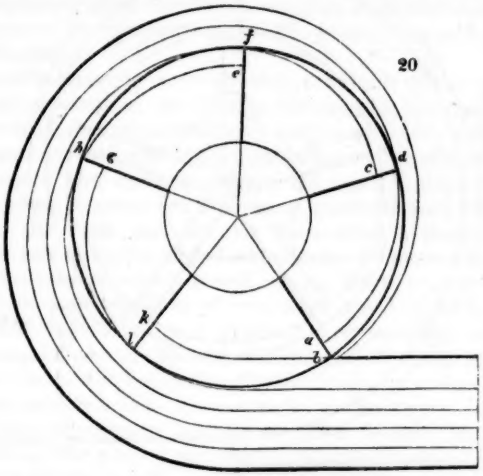


in it, that in the concentric fan only two leaves out of five are effective, and that very little more than one half of the exit pipe is occupied with the regular current of air produced by the rotation of the leaves. The quantity thrown out by virtue of the pressure under which the air is kept by the centrifugal force is, therefore, very small, being intercepted by the current from the leaf *a*, whose tangent crosses the exit pipe completely, and nearly at a right angle.

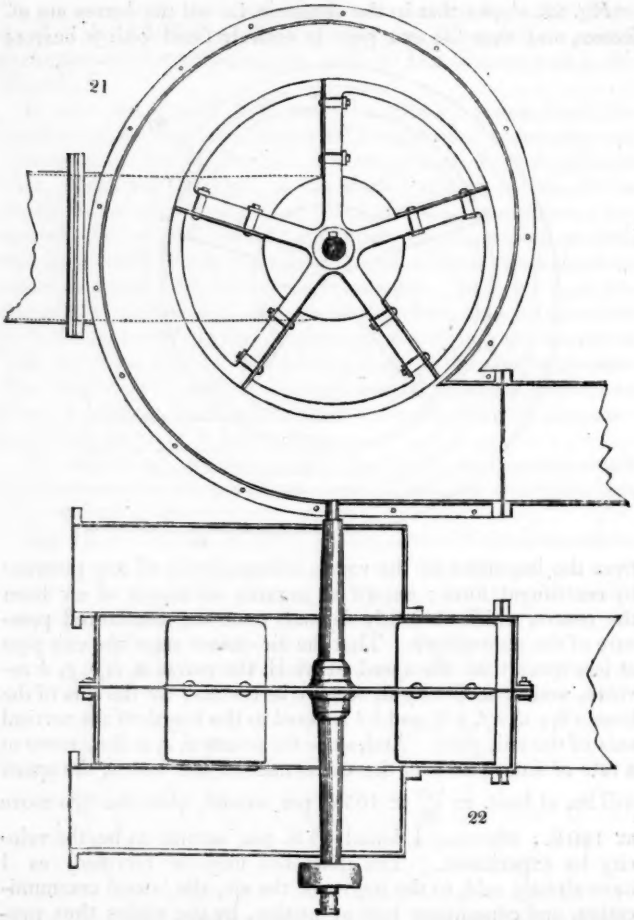
Fig. 20. shows that in the eccentric fan *all* the leaves are effective, and that the exit pipe is entirely filled with a current



from the impulsion of the vanes, independently of any pressure by centrifugal force; except as regards its supply of air from the centre, which obviously depends upon the unbalanced pressure of the atmosphere. That the air cannot enter the exit pipe at less speed than the speed at which the points *a*, *c*, *e*, *g*, *k* revolve, would, at first sight, seem to be certain; for the sum of the lines *a b*, *c d*, *e f*, *g h*, and *k l* is equal to the length of the vertical axis of the exit pipe. And, since the points *a*, *c*, *e*, &c., move at a rate of from $\frac{7}{8}$ to $\frac{8}{9}$ of the extremities of the leaves, the speed will be, at least, $= \frac{7\times 8}{120} = 105$ ft. per second, when the tips move at 120 ft.; whereas, I found 94 ft. per second to be the velocity by experiment. The difference may be ascribed, as I have already said, to the inertia of the air, the lateral communication, and consequent loss of motion, by the eddies thus produced.

Figs. 21. and 22. represent the section and plan of a fan, which is considered by my ingenious friend Captain Ericsson to be of the best construction. The drawing is so plain as to supersede the necessity of a detailed description.

With regard to the quantity of air thrown out by a fan of this construction, it may be ascertained approximately by multiplying the speed of the points *a*, *c*, *e*, &c., by the sectional area of the exit pipe. The absolute force required to work this fan may be calculated, with sufficient accuracy, in the following way: —



Suppose the extremities of the leaves to move at the rate of 80 ft. per second, the sectional area of the exit pipe to be square feet; then $2 \times 80 = 160$ cubic feet; which number, multiplied by 60 seconds, gives a product of 9600 cubic feet of air discharged per minute. This, reduced into weight, will be $\frac{9600}{13} = 738$ lb., put into motion every minute, at the rate of 80 ft. per second. Now, in order to acquire a velocity of 80 ft. per second, a body must be allowed to fall freely through a space of $\frac{80+80}{64} = 100$ ft.;

hence the force required to give to 738 lb. a velocity of 80 ft. per second will be equal to $738 \times 100 = 73{,}800$ lb., lifted 1 ft. high. This number, divided by 33,000, will give a quotient equivalent, in pounds, to the impulsive power of $2\frac{1}{4}$ steam horses for working such a fan.

This calculation agrees well with the result of the trial of a large fan constructed by Captain Ericsson, in the year 1831, at Liverpool, for supporting combustion without a chimney in the furnace of a boiler of 100 horses' power on board the Corsair steam-boat. The diameter of this fan was 4 ft. 6 in.; area of the exit pipe, 3 square feet; effective speed of vanes, 80 ft. per second. To work this fan, he constructed a steam-engine, having a 4-in. cylinder, and 10-in. stroke. The result proved that 120 strokes per minute, with steam of 45 lb. pressure to the square inch, were required to produce a speed of 80 ft. in the fan. The engine being of excellent workmanship, from the well-known factory of Messrs. Fawcett and Preston, at Liverpool, and its motion being directly communicated to the fan, we may fairly conclude that at least 30 lb. to the square inch was the effective pressure of the steam. This number, multiplied by 12, being the area of the piston in square inches, gives a product of 360 lb. for the moving force; and this product, multiplied by 200 ft. (the speed of the piston), is equivalent to 72,000 lb., lifted 1 ft. high per minute, which represents the power of the engine. The quantity of air $= 80 \times 30 = 240$, multiplied by 60 seconds $= 14{,}400$ cubic feet per minute. The temperature of the air, as it entered the fan, was about 300°, and was, therefore, reduced in specific gravity to about 20 cubic feet to a pound. Hence $\frac{14400}{20} = 720$ lb. weight of air thrown out per minute; which, lifted to a height of 100 ft. (the elevation necessary to produce a velocity of 80 ft. per second), would require a force equal to $720 \times 100 = 72{,}000$ lb., lifted 1 ft. high, per minute; which quantity exactly coincides with the power of the steam-engine.

It may be worth while to state, though the fact will be obvious to every practical engineer, that, when the exit pipe of the fan was stopped up, and only a little steam admitted into the steam-engine, the fan-leaves moved at an immense speed, the confined mass of air being kept in perpetual rotation; but, whenever the pipe was again opened, so as to admit the stagnant air, the engine was brought nearly to a stand by the weight and inertia opposed to its motion.

The observations of Saussure, and other scientific travellers in mountainous regions, demonstrate how difficult and painful it is to make muscular exertions in highly rarefied air. Even the slight rarefaction of the atmosphere corresponding to a low

state of the barometer at the level of the sea often occasions no little discomfort to persons of delicate frame; while the opposite condition of increased pressure, as indicated by a high barometer, has a bracing effect upon both body and mind. Hence, in ventilating crowded apartments, such as the Houses of Parliament, instead of having recourse to chimney draughts, as has been hitherto the invariable practice, and which operates by pumping out, exhausting, or attenuating the air (a fact elegantly illustrated by Dr. Wollaston's differential barometer), we ought, upon every sound principle of physiology, rather to increase the density and spring of the atmosphere, by throwing in a continual current of pure air, brought to the proper degree of temperature and moisture in a chamber of preparation. The air, in its ingress and egress, being placed under the control of valves regulated by index-dials, might have its density modified to a very considerable extent, and thus become fitted to supply the lungs of the inmates with an elastic element, eminently conducive to their health, comfort, and activity.

In applying a principle of this kind to ventilate such a noble pile of buildings as the new Houses of Parliament will be, two or more fans of suitable size should be erected in a small apartment on the ground-floor, for the sake of solidity, and near the centre of the range, for the facility of distribution. These fans should be driven by a small steam-engine, with a boiler heated with coke, on Messrs. Braithwaite's safety plan, emitting no smoke, nor requiring an elevated chimney to disfigure the edifice. From the fans, proper conduits, made of wood, brick, or sheet iron, should be led to the floors of the several chambers to be ventilated. The terminations of these conduits should be furnished with proper valves, for regulating, by a dial index, connected with a cord or wire (like a common bell-pull), the degree of ventilation required, according to circumstances.

In the state of scientific excellence at which the arts have arrived in this country, especially among the factory engineers, no doubt can exist about the propriety of heating the new Houses of Parliament by means of a series of substantial cast-iron pipes, filled with steam, placed in a sunk area below the level-line of the chambers; from which, as a vast magazine, genial air, of a proper thermometric and hygrometric constitution, could be readily distributed, in any desired quantity, to renovate the atmosphere of every lobby and apartment in the buildings. The same boiler which furnishes steam to the engine would be adequate to furnish a supply to the warming pipes in ordinary weather. In very severe weather, however, an additional steam boiler could be brought into action; the main object being to provide such a body of genial pure air as country gentlemen are accustomed to breathe in a fine summer's day on their breezy lawns,

but never to be under the necessity of inhaling the mephitic vapours emitted by the lungs and skin of themselves and their neighbours, as has been hitherto the established practice in both Houses of Parliament at every interesting debate.

The quantity of steam-pipe surface, at a temperature of 212° Fahr., requisite to heat a certain volume of air in the large apartments of a well-built cotton mill, has been ascertained with perfect precision; and may be estimated, in round numbers, at one superficial foot of pipe for 150 cubic feet of space, to ensure to the air a steady temperature of 62°, which is the mean summer warmth of the atmosphere in England. It would be prudent to have at command a great magazine of air for the Parliament, since the consumption of fuel under an economical disposition of apparatus would be utterly insignificant, in comparison of the health and comfort of the legislative bodies of the empire.

For the following estimate of the quantity of cast-iron pipe necessary to maintain a healthy and comfortable temperature during winter in the Long Room in the Custom-house, I am indebted to Mr. Fairbairn of Manchester, whose experience and success as a factory engineer are such as to give confidence to his statement. The above apartment is 190 ft. long, 64 ft. wide, and 46 ft. high, containing fully 20,000 cubic yards of space. Two ranges of cast-iron pipes, 8 in. in diameter, properly distributed upon the floor, close to the bottom of the desk-partitions along the two sides and ends of the room, having arched junction pipes of wrought iron 2 in. in diameter, rising round the entrance doors, will be fully adequate to warm it in the coldest winter weather of this climate. A suitable low-pressure self-feeding steam-boiler, with proper pipes and mountings, would, at the usual factory prices, cost no more than 500*l*. Upon this plan, less than one half of the quantity of fuel would be required, of what is now consumed by the air-roasting furnaces, in generating malaria, discomfort, and disease.

Among the stove-doctors of the present day, none are more dangerous than those who, on pretence of economy and convenience, recommend to keep a large body of coke burning slowly, with a slow circulation of air. An acquaintance with chemical science would teach them that, in the obscure combustion of coke or charcoal, much carbonic oxide is generated, and much fuel consumed, with the production of little heat; and physical science would teach them that, when the chimney draught is languid, the burned air is apt to regurgitate through every seam or crevice, with the imminent risk of causing asphyxia or death to the inmates of apartments so preposterously heated. To obtain the maximum quantity of heat from fuel, its combustion ought to be very vivid, and the caloric thus evolved diffused over the largest possible surface of conducting materials. This prin-

ciple has been judiciously applied in several French factories. Great care must be taken not to suffer the surfaces to be heated above 240° Fahr. It has been proved that workpeople employed in calico-drying rooms heated by such means become emaciated, wan, and sickly, while they remain perfectly healthy, and even blooming, in rooms of which the air is more highly heated with steam-pipes.

Among the many causes assigned by pathologists for the infirm health of persons who confine themselves much to warm apartments, and seldom venture into the open air, one of the most operative has been altogether overlooked — the rarefaction, by diminished pressure and heat, of the atmosphere which they breathe.* I find, if a differential barometer, containing proof spirit in the one leg, and oil in the other, have its horizontal tube thrust into the key-hole of a snug winter parlour, that, on turning the stopcock attached to it, the junction line of the two liquids will rise from half an inch to an inch, according to the tightness of the room, and the force of the fire. By opening the street door a further rise will take place. The pulmonary and sanguiferous systems being, in such circumstances, deprived of their due proportion of chemical aliment and physical support, must languish, and spread exhaustion over the nervous, muscular, and digestive functions. I am persuaded that many of the valetudinarian ailments of the opulent inhabitants of the United Kingdom may be traced to their breathing an air unduly rarefied by

* Since the first portion of this paper was put to press, my attention has been called to a memoir of M. Junot, lately published in Paris, concerning the effects of compressed and rarefied air upon the human body. When a person is plunged in condensed air, he breathes with "a new facility;" he feels as if the capacity of his lungs were enlarged; his respirations become ample, and less frequent; at the end of fifteen minutes, he experiences an agreeable warmth in his chest, as if the pulmonary cellules, long strangers to the contact of air, were dilated anew to receive the genial spirit; while the whole animal economy sucks in at each inspiration a fresh supply of life and vigour.

The arterial system acts with increased force, while the veins in the surface of the body are depleted, and may be made even to disappear. The functions of the brain are excited, the imagination becomes lively, and the thoughts are "accompanied with a peculiar charm." The movements of the muscular system are rendered, at the same time, freer and more energetic. Digestion becomes more active, but without thirst (*la soif est nulle*); because the secretory system participates in the increased vigour of the arterial.

In rarefied air, the effects are nearly the reverse of the above: the breathing is constrained, feeble, frequent, ending in dyspnœa, or an asthmatic paroxysm; the pulse is quick, and easily compressed; hæmorrhages often occur, with a tendency to fainting; at length, a defect of vital energy, or apathy, supervenes. The kidneys and salivary glands cease to secrete their respective fluids. M. Junot proceeds to describe the effects of compressed and rarefied air upon different parts of the human body, both in a state of health, and in the cure of diseases, by means of a very ingenious mechanical invention; for an account of which however, I must refer to the memoir itself, in the *Archives Générales de Médecine*, seconde série, tom. ix. p. 157.

chimney draughts. Every well-constructed mansion should have its underground storehouse of temperature, from which a constant supply of genial air could be poured into the several apartments in such quantities as are wanted for comfort, with the effect of increasing rather than diminishing its density. Open fires would, in this case, be used only for enlivening the scene; and, being supplied with abundance of air from the ventilating orifices, could create no appreciable rarefaction.

ART. II. *On the Perspective Plane.* By A. EDMOND, M. A.

IF you think the following remarks on the perspective plane any way useful in settling the opinion of any doubting reader, you will, perhaps, give them a place in your journal.

The problem proposed, in perspective, is: — to determine, and thence to delineate, the apparent form of an object, the object and position of the eye being given; or, to find a plane figure which shall appear to the eye of the same form as the given object.

Without stopping to observe the comparative merits of these definitions of the science, but adopting the usual postulates, I proceed to remark, that, as an object may be conceived to consist of visible points, so the apparent form may be taken to be composed of their apparent positions. We assume that a point is visible by means of a ray proceeding from it; and, setting aside the consideration of the quantity and quality of the light of that ray, all we know of the apparent position of the point is, that it lies in that ray; so that any point in the ray may be taken as the apparent position sought. Hence the apparent form, being an aggregate of the apparent positions, lies also in the rays, its points being any where in them. Hence, if the points are assumed all in one plane, we shall have, constituted by them, a plane figure for the apparent form of the given object in that given position.

If, then, a cone of rays proceeding from every visible point of an object, and from its surrounding ground and sky, be cut by any transverse plane, the section will exhibit the determined apparent form, and thence the delineation. But every object, except a sphere, has various apparent forms, according to the varying position of the eye; therefore, the delineation just found will have various forms, according to the position in which it is submitted to the eye; and there is but *one* position in which it can answer the end "of appearing to the eye of the same form as the given object appeared."

This *one* position is, when the eye is put in its original posi-

tion; that is, when it is in the apex of the cone. And here I may observe, that a hollow cone of cardboard, with the apex removed, will prove a useful aid to beginners, both in understanding and practising the art. Now, let us conceive the machinery of the cone inseparably attached to every delineation: this would secure the just presentation to the eye, and it will enable us to test the advantage of one intersecting plane above another.

We shall have to estimate the advantages of two only: — The one which is *vertical*, cutting the lateral rays of the conic bunch *equally*, but the inferior and superior rays equally or unequally, as may happen; the other, cutting *all* the extreme rays equally, and, therefore, having the axis of the cone at right angles to it; hence, for distinction, it may be denominated the Right Plane, and was introduced by Mr. Parsey.

In the first place, if the axis of the cone be horizontal, both planes coincide. But, if a spectator contemplate a building standing high above his own level, the axis of the cone being therefore elevated; or, if a valley, lying far below him, and the axis of the cone accordingly depressed; if he then delineate, either on the vertical plane, the delineation having, we shall conceive, the apparatus of the cone attached; and if the delineation, or picture, suspended in the drawingroom, be of such a scale as to occupy the wall, or greater part of it, we must look for the apex in the wine cellar or on the chimney top. Or, if the apex must be in the drawingroom, it will be necessary to remove a floor, either above or below, to admit the necessary elevation or depression of the picture. Or, lastly, if both apex and picture must be in the room, it will be necessary to place the picture supine, strutting out some feet from the wall, or, in the other case, prone towards the floor.

Let us now test this picture, when it is delineated on the right plane. Place it vertically, the apex is in the room (the length of the room, in both cases, being unexceptionable, although less length is sufficient for the right plane, if the generating cone be attached). If the picture exceed 10 ft. in height, the apex will be above the ordinary level of the eye, but a slight inclination of the picture will bring down the apex sufficiently; and, if the picture is less than 10 ft., it may have its centre opposite the general eye; or, if placed higher, an inclination again will adjust it. Hence, such pictures would be aptly disposed on the surface of a dome, the eye being in the centre; and this with perfect effect, if they are all constructed with the same distance of the eye from the perspective plane, and if they are of the same, or nearly the same, dimensions. Thus they resemble facets cut on a sphere; and, being conceived reducible in dimen-

sions *ad infinitum*, we may conclude that the perfect surface of delineation, theoretically, is the spherical. Hence, the propriety of the latitude of the first definition of the object of this art.

But there are one or two observations that require a brief notice. First, suppose the picture is that of a lofty tower, as seen by a spectator on a level with its base; then the axis of the cone is considerably elevated, and the right plane is oblique to the horizon. But we have said it is suspended vertically; therefore, says the objector, the tower seems not vertical: it retires, in the picture, from a vertical plane, as it rises in altitude; it is, therefore, a *leaning* tower. But we do not refer the tower to the plane of the wall; for if a view, constructed according to the vertical perspective plane, be submitted to our inspection, when laid on a horizontal table, or when held sloping in the hand, it does not give occasion to the eye to judge that a tower is a great gun or a mortar, nor that the figures are all prostrate on the ground: the eye does not mix up the picture with the adjoining realities. The remark, that great pictures are never so inspected, does not rebut the force of this answer; as, if it be true in the above case, it would hold good with respect to them, if we could conveniently command a fit position to inspect them when laid horizontally.

Again, some one may, perhaps, think that our objection to the awkward disposition of the valley in the drawingroom is not justly levelled against the vertical plane system, because it is the product of a painter, or artist, who scorns all rules, works by his eye, and observes no particular perspective plane. But this is a transient delusion; for, if his eye see truly, and he would convey a *true* image to another, the product of his genius will only accord with truth when it is governed by the rule of perspective, whether obtained from education or intuition. His picture is a plane; and, in constructing it, he must be guided by the laws of a plane.

Another observation is, that the architect may always avoid the objections to the vertical plane, even if his perspective views be so large as to endanger them; for he may imagine the eye of the delineator on all occasions to be opposite the centre of the edifice represented. If the architect may do this, yet the painter of actual views has no such license; and there may be occasions, too, when the architect may feel himself equally restricted, if he be called on to exhibit, say on a large scale, the actual appearances of lofty buildings to a spectator on a level (or nearly so) with their base; as Barry's proposed tower, for example, from a near adjoining street, or the view of a street, consisting of a double range of high buildings, as seen also from some near point. In that case, his view, though it be drawn according to

a vertical plane, will, no doubt, be a true representation; but it will, most likely, be falsely looked at: and that, too, will probably be the fate of all views according to that system, whenever the axis of the cone is not horizontal; i. e. when the point of sight is not in the centre of the picture, where it always is in the right plane system, whether that point be defined the centre of vision, or the site of a perpendicular from the eye to the perspective plane. For the world place the centre of the picture opposite the eye whenever they view it, and have the placing of it; and, when they have not, they naturally make the centre of the picture the centre of vision. To this, the advocate of the vertical plane may reply, that neither will the world detect the proper distance of the apex, when even it is to be found at the level of the eye; but, besides that this is an objection as applicable to the one as to the other plane, and does not remove the former objection, it may be prevented by marking on each picture the proper distance at which it ought to be viewed; or making the cone constant for all pictures. An angle of 19° in the apex gives a distance of three times the diameter of the field of view; an angle of 29° gives a double distance; and 53°, an equal distance.

Lastly, the architect may allege that the rules for the vertical system are either more familiar to him, or more convenient for all the ordinary purposes of his practice, even without putting the eye opposite the centre; for if the distance, when optional, is made of large proportion, the difference between the two representations will almost disappear, and approximation is frequently all that can be obtained in this and other arts. To this it may be in part replied, that long distances are prejudicial to accuracy of detail in certain parts; and that, granting it to be a very close approximation to the right plane, still that ought not to exclude its adoption, especially if its rules are not more complicated than those of the other; and, while science must give it the palm, the artist, in particular, ought to study its effects, as it is the undoubted instructive rule for his eye.

But, while we must confess the decided superiority of the right plane over the vertical, in a scientific point of view, it is quite erroneous to suppose that the principles and rules of the vertical system are false; and, though other systems, and this also, may have defects or disadvantages, it would not invalidate them, even if we could show the right plane to be the only true plane, which, perhaps, is tantamount to calling it the natural plane. Now, there is no proof that there is in nature any plane at all, nor any surface, nor any impress on the pupil, nor any filmy cast of the objects, of infinite contractility, launched incessantly at the eye; but there is proof that an image is formed on the retina, and with that the judgment deals. But, if it could be shown that nature does or must adopt a plane, we may safely

prejudge that this is the one; for, direct your hollow cone from the earth to a balloon in the zenith, or from the balloon to the earth directly below it, and in either case a vertical plane of delineation is impossible. What plane must we then adopt, or what has a preferable claim to the right plane, which will be found constant, and, therefore, the best entitled to be called the natural plane?

Mr. Parsey, the happy author of this improvement in the art of perspective, has, however, in drawing the cube, in his treatise entitled *Perspective Rectified*, compromised the strict rules of the plane, by granting students the license of reducing the apparent heights, in certain cases, without insisting on the convergence of parallel vertical lines. Now, if the reduction is adopted without the convergence, the picture will be distorted; and, accordingly, the picture of a square, seen by an eye opposite any point of the vertical line which bisects it, except the middle, is not a rectangle, as there given, but a trapezoid. Mr. Parsey is, however, aware of the convergence, but has not sufficiently urged the importance of it; for it may be shown that, wherever the eye is not beyond the level of the upper or under boundary of the object, there is a greater portion of convergence than reduction.

It was, perhaps, the omission of this particular that brought on him the imputation of error in principle, from some opponent, who, perhaps, imagining that he meant to set up the chord instead of the tangent of the visual angle of elevation, without making a corresponding change on the chord of the visual angle that lies in an oblique plane, rejected the proposal without farther examination. He, however, has not pointed out how the convergence is to be obtained. It may be done, with great readiness, from the lateral plane put in juxtaposition with the ground plan, and drawing through the second extremity of the sloping perspective plane a line parallel to that drawn throughout the first extremity, constituting the sky line or ground line, as the case may be, which parallel will be duly cut by the horizontal rays proceeding from the various sites of the perpendiculars on the ground plan.

The introduction of the lateral section is also due to Mr. Parsey: it is like a gauging plane or brazen meridian, to furnish the latitudes of all points appearing above the equator, or horizon, or ground line; while the ground-plan exhibits the longitudes, or distances east or west, right or left, of the prime meridian; every point of the apparent form being thus determined by its latitude and longitude on the picture, and having an imaginary parallel of latitude and an imaginary meridian, and the meridians converging when the eye is not level with the centre of the object. This supersedes all vanishing points but one, viz. the place of the eye; and, as that is at the least distance from the

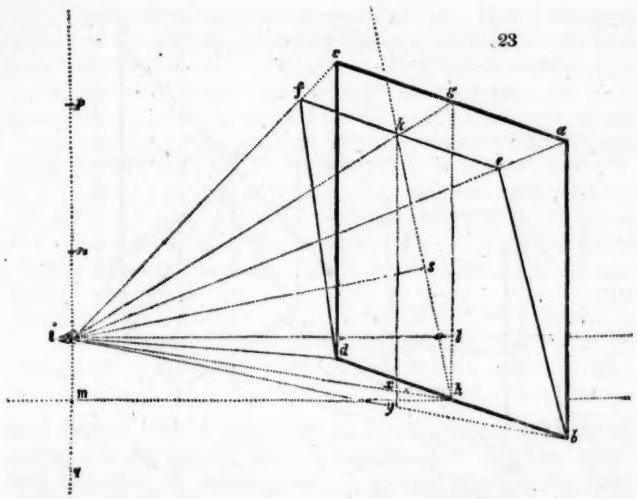
perspective plane, it greatly economises room, and may be attended with other advantages, which practice will readily discover. A word on finding the centre of the picture: — If the cone, which we imagine to be used in taking the view, be made exactly to circumscribe the edges of the square front, in the example formerly alluded to, the picture is a trapezoid, and the point of sight would not be justly found by Mr. Parsey's double bisection; but, if the cone be made to give the same apparent depth of sky as there is of ground, the sky and ground lines being equally distant from the circumference, and therefore from the centre, then the cone does more than contain the trapezoidal form of the square; but the centre of the picture, or point of sight, is then truly found by doubly bisecting the form of the building. Hence it is not right to add ground and sky at option.

I had proposed to calculate the exact reduction and convergence in certain given cases; but a carefully constructed diagram will satisfy the scientific as well as the practical man when to adopt, or when to disregard, with safety, the right plane.

One remark will conclude the subject; and it is, that this plane has its defects as well as all others; for, suppose we are drawing the front of a building 30 ft. or 40 ft. high, the door 8 ft. high, and 4 ft. wide, and the eye on a level with the top of the door; the picture, while the eye is fastened on the centre of the whole, will show no distortion; but let it examine the door singly, as exhibited on it, it will be found that, while the width is, by the scale, 4 ft., the height is more than 8 ft. Now, this objection is not applicable to the vertical plane, when the picture is properly viewed; and the consideration of it suggests to us, that the only true and perfect perspective surface is that of a concave sphere. This we have previously inferred, when remarking on the suitableness of a dome for the exhibition of pictures. Perhaps the panoramic views are the nearest approach to this that we can practically obtain, combining in them the concave and the vertical surface. Card-board might be moulded in the form of a spherical segment, and transparencies might be painted on glass segments; but we leave to the curious to estimate their advantages and disadvantages, either by discussion or trial. We find this spherical surface forced upon our uninformed judgments in the case of the heavenly bodies; which, the quantity and quality of the light not being easily cognizable, being left to be allotted by us to whatever position we may, are looked upon by us as equidistant, that is, as points on a spherical surface.

Description of the Illustrations which accompany the foregoing Article.

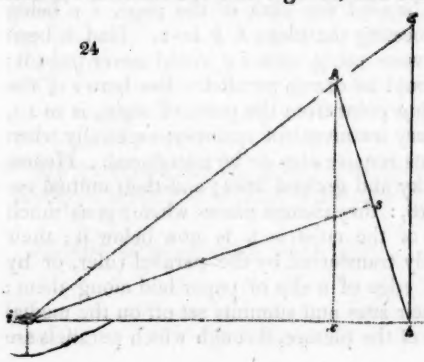
Fig. 23. *a b c d* represents the square front of a building, or the opening of a street; *g h*, the middle vertical line; *i l*, a per-



pendicular ray to the plane *c b*: visual rays are drawn from the principal points, the superfluous ones of the cone being rejected for the present; *i k* is made equal to *i h*, and *e f b d* is the trapezoidal image; *a c* or *b d* becoming *e f*, while *g h* becomes *k h*.

Now, *k h* is not proportionally so much reduced from *g h* as *e f* is from *a c*; for *a c* is to *e f*, as *g i* is to *k i*, or as *g h* is to *k x*. Therefore, if the ratio had been equal, *g h* would have been reduced to *k x*; but *k x* is less than *k y*; and *k y* is less than the hypotenuse *k h*. The inclination of the plane is less than half the visual angle subtended by *h g*.

If *i* were at *n*, opposite half the height of *g h*, then there is neither reduction nor convergence, and the planes coincide.



If *i* be in *m* or in *p* (*fig.* 24.), *k h* is again greater than *k x*; and observe the inclination of the planes, viz. the angle *g h k*, or its equal, *h k x*, equals half the visual angle subtended by *g h*.

If *i* rise above *p*, or fall below *m* (*fig.* 25.), the ratio

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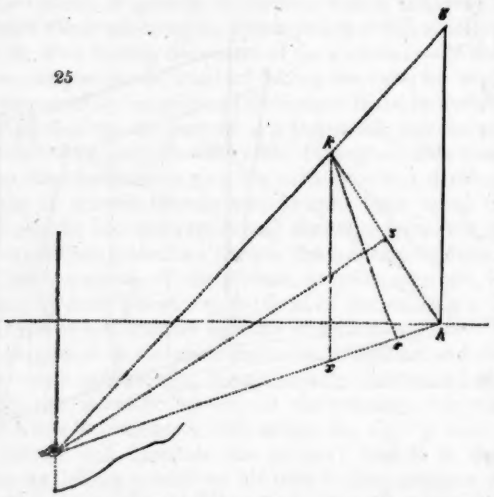
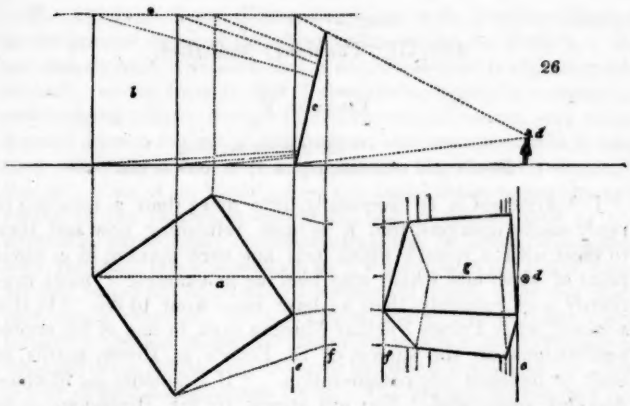


of convergence will be greater, as before, or equal to or less than that of reduction, according as *k h* is, as before, greater than *k x*, or equal to or less than it; and that will happen if the inclination of the planes be less, equal, or greater, than the whole of the visual angle under *g h*. For, let *k r* be at right angles to *i h*, then *h k r* is half the visual angle; and if *k h* equals *k x*, then *r k x* will equal *h k r*, and the whole *h k x* will equal the visual angle, or, by parallel lines, the inclination of the planes, viz. *g h k*. But, if *k h* be less than *k x*, then *r k x* is greater than *r k h*; therefore *h k x*, and also *g h k*, greater than *g i h*, &c.

Now, this convergence was to be effected, in drawing, by means of the vanishing point of the lines *a b*, *g h*, *c d* (*fig.* 23.), which point is at *v*, beyond the limit of the page, *i v* being parallel to *h g*, and meeting the plane *h k* in *v*. Had it been the vertical plane we were using, then *i v* would never meet it; that is, *c d* and *a b* would be drawn parallel. But here *s v*, the distance of the vanishing point from the point of sight, is to *s i*, as *s i* is to *o s*; a very inconvenient quantity, especially when lateral vanishing points require also to be introduced. Hence, the advantage of the sky and ground lines; and their mutual relation is shown in *fig.* 26.: they change places when *i* is as much above the half height of the cube as it is now below it; their sections are respectively transferred by the parallel ruler, or by marks on the straight edge of a slip of paper laid along them; and the latitudes of their sites and summits set off on the medial ray, or prime vertical, of the picture, through which parallels are



next drawn. In the engraving *fig.* 26., illustrative of these remarks, *a* is the ground plan; *b*, vertical plan; *c*, plane equalising the rays; *d*, station point; *e*, ground line; *f*, sky line; and, when the diagram is turned round, *g* is the true perspective view of the object.

Figs. 27. and 28. show the modes in which the apparent form may be encompassed by the cone, the latter being that to which this system is accommodated.

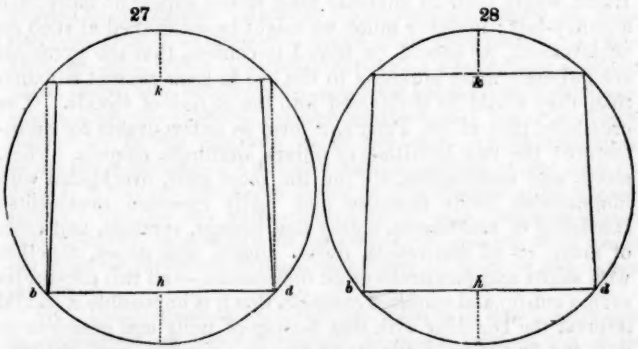


Fig 28. shows that the door *l h* is represented by *h o*, a larger quantity; while the breadth is the same as by the scale.

38. *Hill Street, Peckham, Oct.* 1836.

Art. III. *Candidus's Note-Book.*

Fasciculus V.

"Sicut meus est mos,
Nescio quid meditans nugarum; et totus in illis."

I. Criticism is so frequently little more than a retailing of ready-made opinions, that it is quite refreshing now and then to meet with a remark which sets any such opinion in a novel point of view, and which may lead us to examine it more cautiously and narrowly than we have been wont to do. On this account, what Prince Puckler Muskau says, in one of his recent publications, on the subject of St. Peter's at Rome, merits, at least, to be taken into consideration. "If Bramante (or Michael Angelo) really said, 'You are struck by the Pantheon, as it stands upon the ground; but I will elevate it in the air;' he merely uttered, as others besides him have done, an expression that strikes at first, and takes the hearer by surprise; yet, when it comes to be examined, will be found not to bear scrutinising. Let us suppose any one to say, 'The pyramids are wonders, even on the earth; but I will raise them above the clouds;' and that he were actually to carry his vaunt into effect, by erecting a similar structure on the summit of either the Chimborasso or Mont Blanc, where such an immense mass would appear no more than a sentry-box: however much we might be astonished at such an achievement, we should be forced to confess, that the pyramids are infinitely more imposing to the eye in their present situation than they would be if elevated into the region of clouds. The cruciform plan of St. Peter's, a form so unfavourable for architecture; the vast multitude of pillars, vaultings, chapels, niches, altars, and monuments, all, for the most part, overloaded with innumerable badly designed and badly executed ornaments; consisting of arabesques, zigzag flourishings, symbols, and coats of arms, or of bas-reliefs, doves, angels, and popes, together with saints and patriarchs of all dimensions,—all this constitutes such a cut-up and confused *ensemble*, that it is impossible it should impress the beholder with that feeling of unity and grandeur as does the first view of the Pantheon, in a manner perfectly irresistible. The lavish profusion of ornament, and the modern appearance the church derives from it, combined with its prodigious size, frequently lead those who are astonished by it to exclaim, in a tone of enthusiasm, that it is as sublime as it is elegant! Yet, if we ask ourselves what is meant by elegant sublimity, or sublime elegance, we are tempted to regard such compliment as nothing else than a sarcastic epigram."

II. Although I am disposed to agree with Puckler Muskau in the general scope of the above strictures on St. Peter's, I do not exactly hold with him, that a cruciform plan is objectionable in itself; so far from it, that I consider it highly favourable to architectural effect; though that effect will, of course, very much depend upon a variety of concomitant circumstances, which may tend either to enhance or to impair it. It has been objected, that the dome of St. Peter's does not strike the spectator by any means in the degree it would do, did it display itself to the spectator immediately on his entering the building. Undoubtedly, the effect is not so sudden as it would be in the latter case; yet that would not amount to a serious objection, were the effect to proceed *crescendo*, till it attained a full climax: the more forcible objection is, that the character which is so impressive in the Pantheon, is lost, even beneath the dome itself, and one altogether different substituted for it. We are not within, but *beneath*, a rotunda, elevated far above us, and to be viewed only by looking directly upwards; for in the lower space, where the spectator actually stands, all circularity of plan is entirely lost sight of. There is prodigious, not to say extravagant, altitude; but, then, it is such as to counteract the other dimensions, and to detract from the importance of all the rest; whereas in the Pantheon, whose height does not exceed its diameter, the amplitude manifests itself to the eye at once, instead of requiring to be computed and summed up after the several parts have been examined in succession. Another circumstance to which the Pantheon is greatly indebted for much of its grandeur is, the fine effect of light, which is admitted through a single large aperture in the dome, and, consequently, produces great breadth of chiaroscuro. In St. Peter's, on the contrary, the dome is chiefly lighted by lateral windows in its tambour, which altogether alters the character. The same remark applies to our own St. Paul's, which is still more faulty in this respect; the cupola being, I will not say utter darkness, but mere palpable gloom and obscurity, compared with the rest of the interior, amid which may just be discerned a small twinkling of light in the upper lantern.

III. The mention of St. Paul's leads me to bestow a little *note of admiration* on the exceedingly ingenious view of the dome from the Whispering Gallery, just come out in a new publication. By a most happy *strabismus* of perspective,—there being two points of sight, one of which, I presume, is intended for the right, the other for the left, eye, we are enabled to look down on the pavement below, and upwards into the lantern, at the very same instant! This is capital; second to nothing but the view of the choir, in another print by the same artist, where the sun is shining both on the south and the north wall, and also on the

vaulted roof! Similar felicity of *invention* is displayed in one of the external views, where all the surrounding houses are removed to a most respectful distance from the cathedral, leaving it in solitary dignity in the centre of an area ten times the extent of the real one. This, most assuredly, *non è vero;* yet it is impossible to add that it is *ben trovato.* There are very many other people besides Sir Edward Walpole who learn drawing without perspective.

IV. A word is put in in favour of amateurs in the article on Architecture in the last Number of the *Quarterly;* where, after observing that architects, however much they may dispute on other points, all agree in protesting against amateur judges, the writer observes, "If architecture aspires beyond the mere exercise of a trade, to rank with those finer arts whose predominant merit is the influence they possess over the feelings and imagination of man, its highest pretensions must, like those of its sister arts, be subject to general laws, and its best prize of admiration be awarded by an unprofessional tribunal." He then goes on to support this view of the matter by the parallel case of poetry; in which a person may be an excellent critic, although no poet; clenching his argument by Johnson's observation: "A man may complain of a bad chair or table, who never made either in his life. It is not his trade to make tables."

Afterwards, however, the writer gives amateur architects a rap; telling us of one "who had designed himself one of the prettiest houses imaginable, and was proceeding with the utmost satisfaction, till a stonemason reminded him that he had *forgotten the staircase;*" which, although here attributed to a personal friend of the writer's, is a tolerably ancient joke. After all, too, it tells nothing against amateur architects, further than that the one in question committed an egregious blunder; a blunder, too, of such nature, so palpable and gross, as to be one which the slightest consideration would guard against, and, therefore, not be likely to be committed by any one else. If an instance of that kind is to be held up *in terrorem*, a person ought not to venture to do anything whatever that he does not do professionally. The blunder arose, not from the gentleman's being an amateur, but from his ignorance, or rather sheer thoughtlessness, of what he was about; for an amateur, no more than any one else, can be expected to succeed, unless he will be at the pains of preparing himself by previous study. If the inference obviously intended to be drawn from the anecdote, owing to the way in which it is told, be a correct one, Lord Burlington, towards whom, by the by, the reviewer is not a little complimentary, ought to have shown himself a mere dabbler in architecture, when he pushed his amateurship so far as to tread upon the very heels of the profession, nay, to get ahead of most

of those in it, at that day. Unless they will take the trouble to educate themselves for it, people cannot even be judges of what is good or bad, either in architecture or any other of the fine arts, and must, consequently, be incompetent to sit in "an unprofessional tribunal."

V. For one who would commit such an egregious oversight as that of forgetting to provide a staircase, there are a hundred professional, no less than unprofessional, men who overlook what is highly important in a plan, and which requires to be maturely considered at the very outset, because of that nature, that no friendly "stone-mason" will be likely to perceive and point out the omission. The man who, in planning a house, can suffer such a thing as a staircase, or any other equally indispensable part, to escape his notice, would be apt to forget an ear or a nose were he drawing a face. Consequently, the hit aimed at amateurs by such instances quite overshoots its mark, and is *telum imbelle et sine viribus ictus.*

VI. The newspapers, again, inform us that the king intends to take possession of the New Palace some time in the course of May, but that the levees and drawingrooms will continue to be held at that of St. James's. Are we to infer from this that, after all it has cost, the new building turns out to be so defective in accommodation, no less than in taste, as to be unsuited to those occasions of state ceremonial which ought not to be lost sight of in planning a royal palace? Yet that it is especially calculated for the parade of levees and drawingrooms, cannot be asserted, there being only one, and that a very moderate-sized, staircase for company; and, although hoops are now gone out of fashion, even at court, such an approach would be exceedingly inconvenient where two tides of visitors, the one ascending, the other descending, would encounter each other just on the narrow upper landing of the double flight of stairs. Perhaps the report itself is without foundation, for it has generally found its way into the newspapers, every spring, for the last three or four years.

VII. It admits of question, whether the scheme of inviting foreign architects to enter into competition, which has been adopted for the Exchange proposed to be built at Hamburg, will not furnish a somewhat dangerous precedent, should we ourselves ever think proper to follow it. Of course, it remains for our English architects to show how far they approve or disapprove of such principle, by accepting or declining the invitation thus held out to them; but, should any choose to avail themselves of it, they could not justly complain, were they afterwards to find that similar liberality on the part of this country operated against themselves, and that they had to compete with some of the most able foreign architects. One beneficial consequence,

indeed, likely to ensue from such widely extended competition would be, that it could hardly fail to prove a death-blow to that system of jobbery and favouritism which has so long prevailed, and which renders talent of very secondary influence when opposed to interest.

VIII. Those who have not quite forgotten their Phædrus may, perhaps, recollect the fable of the man who was made quite bald by one lady plucking all the grey, and the other all the black, hairs from his head. It is after such fashion that Hamilton and Welby Pugin (that "præterpluperfect Goth," as the *Quarterly* styles him) would pluck us quite bare; the former weeding out all that is Gothic, the latter all that is Grecian, in our architecture; so that, between them both, we should be reduced to the Marylebone school of design again, till such time as we could invent some style that should be altogether new.

IX. Particularly annoying is it to me to meet with a long newspaper account of the ceremony of laying the first stone of a building, where, although such matter of course things as the "silver trowel," &c., not forgetting the usual dinner afterwards, are gravely mentioned, seldom a hint is dropped as to what the building itself is to be, or even the name-of-the architect mentioned, unless, indeed, the account happens to be furnished by the architect himself. I am of opinion that what Goethe says on the subject of nuptial entertainments and rejoicings holds equally good in respect to ceremonies of the other kind; and that it would be better to postpone congratulation until we see what the splendid structure really turns out. At least, let us have some description given on such occasions, from which we might form some idea of the edifice itself.

REVIEWS.

ART. I. *Report from the Select Committee on Metropolis Improvements; with the Minutes of Evidence and Appendix.*

ALTHOUGH the plans accompanying this Report, amounting to the number of fifteen, are so indispensable, that, without them, we can do little more than barely enumerate the different lines of new streets, and other improvements contemplated or suggested for various districts of the metropolis, we cannot pass by so very important and interesting a parliamentary document, without at least calling the attention of our readers to it.

The following query (No. 124.), put to Mr. Routh, will suffice to give at once a brief summary of the different plans here brought forward:—"Have you seen the statement of intended improvements which has been put in in evidence; one, a new street from the Mansion House to Southwark Bridge; a street long

contemplated from Farringdon Street to Clerkenwell; completion of a street from Waterloo Bridge (which has been carried into effect as far as Bow Street) to Gower Street; the improvement of the street from Lothbury to the Post-Office; from Finsbury Square to Spitalfields, and into Whitechapel; from St. Catherine's Docks to London Bridge, by extending Tower Street, in connexion with Eastcheap; from High Street, Southwark, to run several streets across to the Bridges; from Waterloo to Westminster Bridge on the south; a new street from Westminster Abbey to Belgrave Square; the removal of Middle Row, Holborn; a new street from Holborn to Oxford Street; a new street from Holborn to the Strand; to widen the Poultry; a new street from the Post-Office to Smithfield and to Holborn; a new street from St. Paul's to Blackfriars' Bridge; to widen Thames Street; to widen Holywell Street; the Post-Office to be thrown open to Cheapside; to purchase Waterloo and Southwark Bridges; to make a street from the Haymarket to King William Street, Long Acre? Is it your opinion that it would be highly beneficial to the public to have those streets made?—Decidedly."

To which "decidedly" we add our *ditto;* for that most of these alterations are imperatively called for, will be apparent, we think, to any one who will be at the trouble of examining any map of London. Very much, indeed, has been done, of late years, in improving and opening both the western and eastern extremities of the metropolis; but, with the exception of the two main lines formed by Holborn on the north, and the Strand and Fleet Street on the south, the whole of the intervening space is very badly planned, if planned it can be said to be at all; and there is a very great want indeed of some good lines of communication running from north to south, such as would be formed by continuing Farringdon Street as above proposed, and by connecting Gower Street with Bow Street. That a new street from Oxford Street into Holborn, joining the latter at what is now the narrow entrance into Plumtree Street, would be exceedingly desirable, although, as a communication, not quite so much called for as some of the other projected plans, will hardly be denied, when it is considered how highly beneficial such alteration would prove, not to the immediate neighbourhood alone, but to the whole of that part of the metropolis, by cutting through and removing the whole of that mass of wretchedness known by the name of the "Rookery." The account given in evidence, both as to the horrible loathsomeness of the habitations, and of the brutality of the population who harbour there, is actually appalling and sickening: to such a degree, in fact, that those who form their ideas of London from Regent Street and the Parks, must imagine the whole to be a piece of fiction—a description of some *terra incognita*, peopled by savages. Neither

are many parts in the vicinity of Waterloo Bridge at all better, according to Mr. Cottingham's evidence, except that they are less filthy.

"As regards the tolls upon Waterloo Bridge," says that gentleman, "I am of opinion, that the opening of that bridge would be one of the greatest possible benefits to the parish of Lambeth, and particularly in a moral point of view. The depraved, debased, and infamous state we are in, in the direct line of the Waterloo Bridge Road, surpasses anything that ever existed in this great metropolis. Such is the state now of prostitution, and of thieves and vagabonds of every description, on that side of the water, that property, within the last five years, has decreased in value at least 35 per cent: houses which I let, in the Waterloo Bridge Road, six years ago, at 65*l.* a year, are now standing empty at 40*l.* a year; and I consider this, in a great measure, to arise from all the streets and communications, both in the road and out of the road, being inhabited by common prostitutes and thieves of the lowest and worst description; and I am of opinion, that, if the toll were taken off that bridge, the influx of people into the parish of Lambeth would be more than 200 per cent greater than it now is, and would be the great means of removing those intolerable nuisances occasioned by common brothels. There are whole streets that communicate with Waterloo Bridge Road entirely inhabited as common brothels"!

This is indeed a most deplorable picture, almost sufficient to deter any one from joining in the first "influx" into so abominably depraved a district. Yet such is likely to be invariably more or less the case, when, for want of streets adapted to tradesmen and other reputable occupants, entire districts are abandoned to poverty and vice, huddled up together; the one removed beyond the sphere of aid and sympathy, the other beyond that of check and control; whereby the evils almost inseparable from a vast and densely populated city are augmented in a most lamentable degree. Independently, therefore, of increased facility of communication, whatever tends to cut through such pestilential neighbourhoods, to carry improvement into the heart of them, and to distribute among them a class of inhabitants who, being in no danger of being corrupted by them themselves, would gradually help to civilise them, ought to be hailed as an improvement of the most praiseworthy description.

Yet, although no one (none of our readers, at least) will question the utility and desirableness of the projected plans, many will very naturally ask by what means such various and very extensive improvements are to be carried into effect; for neither are old houses pulled down, nor new streets built up, quite so expeditiously and cheaply in reality as they are upon paper. The reply is furnished by the Report, which informs us that two

modes of raising the money required have been brought under the consideration of the Committee: 1st, by an additional duty of 6*d.* per ton upon coal imported into the port of London; which, it is calculated, would produce somewhat more than 53,000*l.* per annum; 2dly, by raising a sum of money annually by lotteries; by which, it appears, from 100,000*l.* to 200,000*l.* per annum might be raised; while it is stated, that the revival of lotteries for such purposes would be in itself a public benefit; inasmuch as it would keep in this country the money now embarked in foreign lotteries, and also tend to injure those fraudulent lotteries known by the name of "little-goes."

The plans would afford matter for much longer comment than we can now enter upon; we shall therefore content ourselves with observing, that those which promise to conduce most to effect, without taking into account the other architectural improvements they would give rise to, are, that for the street from Pimlico and Belgrave Square to Westminster Abbey, where the west front of that building, cleared of its present excrescences, would display itself at the termination of the vista; the street from St. Paul's to Bridge Street, coming out at the corner of Earl Street, which would afford another view of the front of the cathedral; and thirdly, the street from Newgate Street carried in a straight line to the portico of the Post-Office. This last-mentioned street would run parallel with, and close by, the hall of Christ Church Hospital, which stands obliquely to Newgate Street; but then it cannot be carried into effect without taking down nearly the whole of the lately erected building belonging to the hospital, and forming the east side of the court in front of the hall; so that we apprehend this improvement, at least, is not very likely to take place. H. C.

We have been informed, on what we consider undoubted authority, that some of the best plans sent in to this Committee are not published in the *Report*; instead of which certain others are given, which, if carried into execution, would prove more costly, and less beneficial to the public, though calculated to increase the value of property in particular localities. We think it right that the public should be put on their guard against manœuvres of this kind. As to taxing coal, or countenancing lotteries, for carrying the proposed improvements into execution, we think both sources of income radically bad. The proprietors of ground ought alone to be taxed for such improvements, because it is they who will chiefly benefit by them.—*Cond.*

ART. II. *Observations on a Letter from W. R. Hamilton, Esq., to the Earl of Elgin, on the new Houses of Parliament.* By Colonel J. R. Jackson. 8vo, pp. 46. London.

THIS pamphlet has the merit of being written with great moderation; but there is nothing in it either new, or presented in a very forcible manner. The author admits the beautiful simplicity of Grecian art, but prefers the Gothic for the houses of Parliament, from the early associations connected with that style. The following quotation not only contains the essence of all that is said in 46 pages, but gives an exceedingly good idea of the character of the writer's mind:

"The Gothic is eminently English in every respect: by its early adoption and very general use for ages, and by its having been brought to the greatest perfection in this country. It is the architecture of our history and our romance. Our kings of old held court in Gothic structures. In buildings of a similar character our British barons held their lordly revels, or, in times of feudal warfare, aided by their kinsmen and valiant vassals, withstood the assaults of rival chiefs. In Gothic halls, our ancestors met in council to frame laws, and weigh affairs of state. The seat of every great event of England's olden time is connected, in some way or other, with the pointed arch; and, as I have said, our very romance is of Gothic connexion.

"Murders, ghosts, midnight noises, banditti, persecuted damsels, high-born dames, and gentle pages, knights, and squires, and all the tales of wonder that charmed us in our early youth, are connected in our minds with Gothic vaults, and keeps, and watch-towers, and dungeons, and subterranean passages, and oriel windows, and latticed casements; and, though certainly no reason this of itself to warrant a preference of Gothic architecture for a House of Parliament, it goes to prove that we are intimate with Gothic forms, and that they constitute in our minds very positively, though perhaps unconsciously, a connecting link in that great chain of associations which bind us still more closely to our country. Gothic forms are like old friends: we love them rather in consequence of our long intimacy, than for their beauty; though pure Gothic has striking beauties. Thus, then, it appears to me, that a patriotic, which is little less than a religious, feeling, is intimately connected with our determinations regarding the style of architecture of the Houses of Parliament; and that the Gothic style, being, for many reasons, peculiarly familiar to us, is more national than any other; and, in consequence, the most appropriate for the building in question; and, further, that this being the style of by-gone times, so far from being any disparagement, is, on the contrary, an additional reason for its exclusive adoption. We should religiously cherish the recollections of, and nourish a warm feeling for, every thing which brings to mind the time when England had virtues to be proud of, though steam and railroads were unknown."

ART. III. *A Complete Scientific and Popular Treatise upon Perspective, with the Theories of Reflection and Shadows; illustrated with twenty-four plates.* By a Pupil of Mons. J. P. Thénot. London, Simpkin and Marshall

NOTWITHSTANDING the frequent remarks, that "science is on the decline in England," and that "perspective has not been so popular here as on the Continent, nor has it kept pace with

our general progress in intellectual improvement," the many works which have appeared in this country, within the last few years, on the branch of science on which the above work treats, go far towards establishing a contrary inference with regard to the individual subject in question; as the circumstance of these works being encouraged by the public, shows that a taste for perspective is on the advance.

To the scientific reader it is unnecessary to point out the utility of perspective; and to the general reader it must also be evident that this science does not merely afford assistance to the artist, but that, without a knowledge of it, he cannot advance one step beyond the rude essays of uncivilised life. Indeed, a knowledge of perspective is so essential to the cultivation of a system of true delineation, that it may be considered as the foundation of the pictorial art; while historical and landscape painting are indebted to it for those graphic illusions, and pleasing associations, which have tended so much to refine and embellish society.

The present volume commences with a well-written preface, in which we are told, that "the work is one of those destined for the instruction of the mass; and, with a view to fit it to this purpose, the method through which the information has been imparted has been simplified as much as is compatible with the subject." The work fully supports these remarks; for the principles of perspective are so clearly demonstrated, and practically applied in so popular a manner, that they may be understood by any one unacquainted with geometry, by merely attending to a few definitions, and a few elementary diagrams, which are of necessity given.

The subject of perspective is commenced by fully explaining what the author calls the "rational horizon;" which horizon it is essential that the learner should perfectly understand at the very commencement of his studies. It might be wished that, at this point of the course of perspective, the *plane* of projection had also been fully explained; that is, that a sectional diagram had been given, showing the relative positions of the eye, the picture, and the objects viewed; which would have been more explanatory to beginners than placing the point of distance on the horizontal line.

It has been said, that the plane of projection, or the picture, is nothing more than nature seen through a window; and that, if the student draws on the glass the objects seen through it, the objects thus drawn would be in perfect perspective. Now, this remark requires to be qualified; because they would only be correct when the axis of the rays, or that of the central ray, was perpendicular to the glass, which would seldom be the case. The equalisation of the rays, however, the author has not con-

sidered; and, therefore, the sectional diagram before alluded to would show that, to obtain the true heights of objects, the plane, or picture, must cut the rays perpendicularly to their axis vertically as well as horizontally.

The work is followed up with directions for putting into perspective a number of familiar objects, such as buildings, figures, trees, furniture, &c., which are far preferable for the learner to mere geometrical figures. To extract any part of the work would not do the subject justice, as it forms a regular progressive course of perspective, the whole of which is equally comprehensive and instructive.

The instructions given for the representation of irregular figures, curved lines, circles, arcs, &c., are full and satisfactory: but there are other features in the work which deserve to be particularly noticed, as they are seldom found in books on this subject. These are, the simple instructions which the author has given with respect to working with a fraction of the distance, when the entire distance is without the picture; also the directions given for measuring all kinds of perspective lines, as well as the rules for placing figures on inclined planes in perspective. Indeed, this part of the work, as well as every other part, shows that the author is perfect master of his subject, according to the system he has adopted.

While, however, I thus bestow due praise on a work which deserves a place in the library of every one interested in perspective, it may be well to observe, that the present volume is more adapted to the historical, the landscape, and the decorative painter, than to the architect, engineer, and mechanic. In the first place, the different objects are put into perspective by lines drawn on the picture, instead of the various points being projected from a ground plan, as is generally done by architects, engineers, &c. This, however, is no defect, but a convenient mode for artists; while it would be, perhaps, the reverse for architectural and mechanical draughtsmen. The illustrations, also, are chiefly in parallel perspective, which is a mode of representation more particularly suited to the artist than the architect, &c.; and, consequently, the outline of surfaces parallel to the picture are represented geometrically; which, by the way, would only hold good when the eye was exactly opposite the centre of such surfaces. The parallel method is, of course, best adapted to the representation of a multitude of objects; but the architect and engineer, who are chiefly concerned with individual objects, choose more frequently the angular method, and, more particularly, with the objects placed in that position that the lines vanish to accidental points upon the horizon.

The instruction given in the work for this latter mode of representation is very limited. No publication has yet explained

angular perspective more fully and satisfactorily, though technically and theoretically, than the works of the celebrated Peter Nicholson; which works are, however, bulky and costly volumes, the article on perspective being combined with other useful and instructive matter. These remarks, as before observed, together with a foregoing observation, that "the author is perfect master of his subject according to the system he has adopted," are merely to show that, although the work would be useful to an architect, it would be more so to an artist. But the above quotation with respect to system is intended to have a farther meaning, which it may be necessary to explain.

In all the plates of this work there are objects placed on one side of the principal vanishing point in parallel perspective, while there are no objects on the other side. Now, the line from the eye to the vanishing point is the axis of the rays horizontally; and if this line, with the outside ray from the extremity of the object, form no greater angle than 30°, then the representation may be said to be correct, because the same number of degrees is allowed for the other side of the central ray; and, although there are no vertical objects on that side, the eye may be supposed to be looking on the ground; but, if the angle on either side of the central ray is more than 30°, the representation may be considered incorrect, because objects cannot be seen distinctly under a greater angle than that of 60°. Now, instead of placing objects on one side of the central ray, with one surface parallel to the picture, the general practice, or the practice that ought to be general, is (unless, indeed, the object can be seen under a very small angle), to draw the extreme rays from both sides of an object, equally divide the angle formed by the rays, and let the plane be placed perpendicular to the division line; then the object immediately assumes the angular position, and the boundary lines vanish to accidental points on the horizon.

While, in viewing a group of objects, the eye ought to rest near the centre of the mass; so, also, with individual objects, the eye ought to rest near the centre; but, in the cases above adverted to, that is, in the plates of the work before me, the eye looks straight forward in viewing an object placed a great deal to the right or to the left. If it were necessary to explain this point farther, it might be observed, that a person standing in a room, and wishing to view another person coming in at the door, would never think of fixing his eye on the wall some feet beyond the door's architrave: he would surely look at the object approaching.

After having fully exemplified the principles of perspective, and practically applied them to the representation of numerous objects of various forms and sizes, the author passes on to the subject of shadows in perspective. The principles of this subject

he has fully and satisfactorily explained, and given judicious examples for finding the shadows thrown by objects, when the luminous body is placed in three different situations; namely, within the picture, out of the picture before the spectator, and out of the picture behind the spectator. The manner of throwing shadows in the architectural compositions in perspective, annually exhibited at the Royal Academy, shows that the theory of this branch of the art has not been so much studied by architectural draughtsmen as the projection of objects in perspective: but no one need be ignorant of the subject who is in possession of the present treatise.

The pages explanatory of shadows, as also those on the reflection or perspective repetition of objects in water and looking-glasses, together with the illustrative engravings to both, are not the least valuable parts of the work; but they must be read and examined to be appreciated.

There are a few typographical errors in the work, such as, p. 13, for "Fig. 24," read "Fig. 42;" p. 16, for "Let A C be the larger diameter," read "Let A B be," &c.; p. 43 (new par.), for "Fig. 69," read "Fig. 70;" p. 58 (end of 1st par.), for "A C, B E, are equal," read "A C, B C," &c.; insert Y, on the line U, in fig. 89, plate ix. In the Note in p. 91, for "*where* the edifice transparent," read "*were*," &c. Some of these mistakes are, however, in a book of this description, even with the greatest care, almost unavoidable.

In conclusion, the work is, on the whole, well got up; the demonstrations are clear and comprehensive; and, while the text is written in a popular manner, and divested of unnecessary technicalities, the plates are free from that confusion generally to be found in those of books of this description. There is no doubt, therefore, that the work will be well received by all those who, from pleasure or necessity, use the painting brush and drawing instruments, and have any desire to be able to delineate objects correctly. R.

Feb. 8. 1837.

ART. IV. *Literary Notices.*

A CONTINUATION of Pugin's Works on the Architecture of the Middle Ages, by Thomas Larkins Walker, Architect, Honorary Treasurer of the Architectural Society of London, is publishing in Parts, the Second of which will appear on the 1st of May next.

Temples, Ancient and Modern; or, Notes on Church Architecture, by William Bardwell, Architect, in one volume 8vo, will speedily appear.

A complete Analysis of the projected Railways in England and Wales, 1836-7, *for which Notices of Application to Parliament, in the ensuing Session, have been given, and the requisite Documents lodged with the several Clerks of the Peace, and in the Private Bill Office of the House of Commons*, by Francis Whishaw, Esq., Civil Engineer, M. Inst. C. E., is in the press.

The Gallery of Practical Science, First Division (*Mechanics of Fluids and Hydraulic Architecture*), is just published.

A Tabular Chronological Epitome of the History of Architecture in England, by George Godwin, jun., Architect, Associate of the Institute of British Architects, price 1*s.*, is just published.

Railway Practice, by C. J. Bree, C. E., in one vol. 4to, with 40 or 50 plates, is nearly ready.

A Treatise on Artificial Foundations for Buildings, Railways, &c., by C. Davy, Arch. and C. E., in one vol. 8vo, illustrated with Cuts, will very shortly appear.

The professional Life and Works of the late Sir John Soane, by T. L. Donaldson, Hon. Sec. of the Inst. of Br. Archs., &c., is just published.

MISCELLANEOUS INTELLIGENCE.

Art. I. *General Notices.*

Origin of Gothic Architecture.— There has been a good deal of ingenious writing about the origin of Gothic arches. The interlacing of tall trees in an avenue, as it has something of the effect, has also been considered as the original model, of the interior of the Gothic cathedral, and what the earliest architects may have proposed to imitate. The origin is probably much less picturesque. The people of the north of Europe, before their conversion to Christianity, buried their dead, like all barbarous nations, with their arms and implements, and even their horses, slaves, and sometimes their wives. On the sea coast, the boat in which the chieftain sailed was laid over the body, and the tumulus was raised over its hull. This circumstance repeatedly occurs in the *Saga;* and the ship tumulus is distinguished by all Scandinavian antiquaries, as distinct from the round heaps, or mounds of earth, raised over stone coffins, or other receptacles. Its inside would be exactly a Gothic building in wood; and the main body, the nave (navis), is called the ship of the building in the ancient northern languages, probably in reference to this origin. (Laing's *Journal of a Residence in Norway.*)

Defacing public Buildings and other Objects.— In France and Italy, so strong is the admiration for public gardens, for statuary, and other works of art, that they may be exposed to the public for years together, without getting in the slightest degree defaced or destroyed; whereas in Great Britain every public edifice, monument, or iron railings, is more or less injured. If a gentleman, in the neighbourhood of a town, give the public the privilege of walking through his grounds, he may expect to find the borders trod upon, and flowers plucked up, perhaps by the root, his trees cut or torn down, and every thing more or less destroyed. In one of the public gardens in a town on the Continent, a nightingale built its nest and hatched its young inside a bush, within reach of the public walk. A footman, servant to an English family resident there, observing the nest, seized it and carried it off. So strong was the indignation of the populace, who caught the offender in the act, that he was

brought before a magistrate, and condemned to be drummed out of the city, with a label on his breast, intimating his crime; which was executed amid the hootings of the populace. Whatever virtues the people of Great Britain possess, they have yet to learn the practical principle, "Look at every thing, and touch nothing." We know of nothing that will operate as a cure so powerfully as the establishment of schools for infant and juvenile training; and we appeal to facts in proof of this position. (Stow's *Training System.*)

Reasons why Arcs of Ellipses, or Circles, are pleasing to the Eye.— Professor Müller of Berlin has, in a late course of lectures, offered a simple and mechanical explanation of the universal admiration bestowed on these curves. The eye, he observes, is moved in its socket by six muscles, of which four are respectively employed to raise, epress, and turn to the right and to the left. The other two have an action contrary to one another, and roll the eye on its axis, or from the outside downward, and inside upward. On an object being presented to the eye for inspection, the first act is that of circumvision, or going round the boundary lines, so as to bring consecutively every individual portion of the circumference upon the most delicate and sensitive portion of the retina. Now, if figures, bounded by straight lines, be presented for inspection, it is obvious that but two of these muscles are required; and it is equally evident that, in curves of a circle, or ellipse, all must alternately be brought into action. The effect, then, is that, if only two be employed, as in rectilinear figures, those two have an undue share of labour; and, by repeating the experiment frequently, as we do in childhood, the notion of tedium is instilled, and we form gradually a distaste for straight lines, and are led to prefer those curves which supply a more general and equable share of work to the muscles. (*Mech. Mag.* Feb. 4. 1837) The above appears to us to explain the reason why groups of circular-headed windows, which are so frequently introduced into elevations in the Italian style, are so pleasing to the eye. — *Cond.*

Art. II. *Foreign Notices.*

GERMANY.

The Palace of Wilhelmsburg at Brunswick. — An engraving of this splendid building has just been published at Paris, from a drawing made by C. F. Ottmer, its designer, and the superintendent of its execution. The style is Roman, highly enriched. The centre consists of a quadrangle, with a Corinthian portico over a triple archway, and it is joined to two wings by a Doric colonnade, like that of St. Peter's at Rome, and Casan at St. Petersburg, open on all sides. The wings are composed of two orders; a Doric on the basement, of the same height as that of the colonnade, surmounted by the Ionic. Taken altogether, this appears to be one of the most splendid residences of any private individual on the Continent; the proprietor, W. Von Marenholtz, being nothing more than a *Freiherrn*, which answers to the rank of Esquire in England. We have two trifling instances of what we think bad taste in this design: the first is the erection of the equestrian statues on each side of the main entrance, which are represented in the most violent motion, even much more extravagant than that of the statue of George III. in Pall Mall East; and which are totally at variance with Lessing's doctrine, that sculpture ought to be limited to the representation of objects in a state of repose. The second fault is, that the vases which surmount the colonnade are represented as filled with flowers; which is such a mixture of the real with the imitative, of the highly artistical with the purely natural, that we are at a loss to conceive how such an artist as M. Ottmer could endure it. The entire building stands on a raised platform, which has an exceedingly good effect as a foreground.— *Cond.*

Prague, September 16. — Monsieur Stamman, architect, of Hamburg, and formerly pupil of Gau at Paris, has recently paid a second visit to England. He has, for the last three or four years, been in Italy, completing his studies among the monuments of that country; and I believe it is very probable that he will ultimately settle at Prague. His brother, also an architect at Hamburg, has recently tried an experiment in that city which has set all the sober people a wondering. He has recently erected a house for one of the citizens, and covered it with polychromic (various-coloured) paintings, outside as well as in, following up the subject which now so much occupies the antiquarians and architects of Germany and France. The colours employed are, deep red, blue, and yellow; and the window bars are gilt. The art, in this country, has been lost since the times of our Gothic ancestors, who have left us numerous, though scattered, specimens of this decorative embellishment in their churches, chapels, tombs, &c., which were once resplendent with all the accessories of gilding, colour, and brilliant effect of chiaroscuro. — *S. L. F. H.*

RUSSIA.

A Column has recently been erected to the memory of Alexander I. in Petersburg, in the Place ——, of which the following are the dimensions: — Shaft of the pillar, in one piece of granite, length, 84 ft.; diameter, 12½ ft.; weight 350 or 400 tons. The bronze figure on the top is 15 ft. high, independent of the cross, or 23 ft. with the cross; weight, 13 tons. The bas-reliefs are in four plates; and the length of each 17½ ft.; the height being 10½ ft. Some ofthe figures stand out nearly 2 ft. The weight of the four plates is 44 tons; entire height of the monument, 154 ft.; weight of brass, 158 tons. The erection of this monument cost 10,000,000 of rubles, or 400,000*l.* sterling!; and it was erected in two years and a half. The stone pedestal on which the whole stands is 28 ft. square, and 7 ft. thick.

SOUTH AMERICA.

Railroad across the Isthmus of Panama. — The government of New Granada has issued a decree, authorising the establishment of a company for the purpose of opening a communication between the Pacific and Atlantic, across the Isthmus of Panama, by means of a rail, or a macadamised, road, and of navigating the river Chagres by steam-boats. (*Newspaper.*)

AFRICA.

Moorish Manner of building. — Temple, in his *Excursions in the Mediterranean*, gives the following curious account of the mode of building at Tunis, on the African coast: — "On speaking to the architect and engineers, and asking them to show me their plans, they, at first, did not seem to understand what a plan was: when it was explained to them, they declared they had nothing of the sort, and that, in fact, the Moors never made any previous to commencing a building; but that they built by the eye a certain length of wall, and that, when this had been sufficiently prolonged, another was built at right angles to it, and so on. What is still more remarkable, their arches are also constructed entirely by the eye, and have no framework to support them during the process; which is as follows: — A brick, presenting its broad surface to view, is placed with its edge on the buttress where is to commence the spring of the arch; another is made to adhere to it by means of a very strong cement, made of a gypsum peculiar to the vicinity of Tunis, which instantly hardens; on this brick is placed another in the same manner; and thus they proceed till the arch is completed. I saw a vault myself thus made in less than an hour and a half. These arches and vaults, when finished, are very graceful and correct in their proportions, and nothing can equal their strength and solidity. In building walls, an oblong frame, about 7 ft. long, and as broad as the wall is intended to be, is placed on the foundations, and then filled with mortar

and pieces of stone. In a few minutes, the frame is removed, and placed in continuation of the line. This method appears to have been adopted in the construction of Carthage." (*Chambers's Journal*, Feb. 4. 1837.) May not the above mode of constructing arches be, after all that has been said on the subject, the real origin of the Gothic style? — *T. B. London*, Feb. 10. 1837.

Art. III. *Domestic Notices.*

ENGLAND.

The new Houses of Parliament. — I think every one who gave designs for the new Houses of Parliament should be examined before a committee, in order that the whole stock of knowledge accumulated by those individuals should be secured, and adopted where applicable. Every one should suggest his leading points; but no discussion should be permitted as to the style or site They should be allowed to suggest improvements in Mr. Barry's plans, which he should have an opportunity of repelling or adopting, like any other English trial. They should be allowed to give their opinion as to the means of construction and application of materials. Each man should be limited to the principles of his own design and Mr. Barry's. — *W. T. Norwich, Jan.* 15. 1837.

Addition to the Post-Office. — It is contemplated by Sir Robert Smirke to place a portico, or corridor, on the south end of the Post Office. — *Id. Feb.* 1837.

The Duke of Wellington's Monument. — Many sites have been suggested for this statue. There may be two or three open spaces in the approaches of London Bridge fit for it; but, if a few houses which now stand on the north side of Cheapside were razed, that would probably prove the best situation. The improvement which would take place from this alteration has often been pointed out. A view of the Cathedral of St. Paul's would be obtained from St. Martin's le Grand; and the site for the monument would be in the very centre of the metropolis, and on the highest ground. — *Id. Feb.* 1837.

Venetian Blinds made of Glass, instead of Wood, if the expression may be used, have recently been invented by Mr. Bailey, a glazier, and may now be seen at Mr. Fair's Exhibition Room, in Mortimer Street. The invention is pleasing and ingenious; and may, perhaps, with the improvements of which it is susceptible, come into occasional use in dwelling-houses and houses containing stores. It appears suitable for water-closets; and, properly arranged, would form the best of all roofs for those descriptions of plant-houses in which the plants remain under cover throughout the year. We pointed out this in our *Remarks on Hot-houses*, published in 1817; and not only illustrated by a plate (pl. vii.), of which *fig.* 29. is a copy, but had a specimen of it erected at

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Bayswater, where it remained for several years. The following is a description of the figure given in the *Encyclopædia of Gardening*. The polyprosopic hothouse (*fig.* 29.) resembles a curvilinear house, but differs in having the surface thrown into a number of faces; the chief advantages of which are, 1. That, by hinging all the different faces at their upper angles, and by

having rods connecting the lower outside corners of the faces, terminating in chains, which go over pulleys in the top, or above the back wall, the whole roof, including the ends, may be opened or raised sympathetically, like Venetian blinds (*a*), either so as each sash, or face, may be placed in the plane of the angle of the sun's rays at the time, or to the perpendicular, to admit a shower of rain. In consequence of this arrangement, the plants in a polyprosopic house may, at any time, and in a few minutes, be placed, in effect, or as far as respects light, air, wind, rain, dew, &c., in the open air; and, being so placed, may, whenever desired, be as speedily restored again to their proper climate. The arrangement by which this is effected, and which is perfectly simple, is applicable to every form of hothouse, whether of glass on all sides, on two, or on three sides; or whether the roof is formed of curved or straight lines. We consider it, indeed, to be the *ne plus ultra* of improvement, as far as air and light are concerned. One objection to all curvilinear forms is, that the roof, unless a considerable expense be incurred, must be fixed, and air admitted by horizontal wooden or glazed shutters in the parapets, or between the props, and allowed to escape by skylights or shutters at the top of the back of the wall. But here the air is equally admitted in every part of the house, in the most natural manner, without the creation of currents or eddies, and without excluding any more sun than will be obstructed by the thickness or edge of the faces or sashes. In like manner, a great objection to straight-lined roofs with sliding sashes is, that air can only be partially admitted, and that, while this is being done, one glazed frame being slid over the other, in all those parts where there is a double portion of glass, a double portion of light must be excluded; and the light so transmitted will be doubly decomposed, by passing through two surfaces of glass. (*Encyclopædia of Gardening*, new edition, p. 586.) We make this quotation, to show to our readers, and to Mr. Fair, to what important purposes Mr. Bailey's invention is applicable in gardening, if not in architecture. — *Cond.*

The Medals of the Institute of British Architects to be awarded in 1838 are: On the Excellencies of Athenian Architecure; on the Embellishment, by Colour, of the Architectural Members of Gothic Architecture; and on the Improvement made, during the last 100 Years, in the Theory and Practice of Construction. Besides these, there is the Soane Medallion, which is to be awarded for the best restoration of some ancient religious building or castle. We refer for farther details to the advertising sheet; remarking only, that, as the subjects are of very great interest and importance, and as the competition is not confined to members of the Institute, we trust there will be many candidates. Even to fail in such a competition is honourable, and, by the studies it will require, must be beneficial to the student.— *Cond.*

Art. IV. *Institute of British Architects.*

February 27. 1837.— G. Moore, Fellow, in the Chair.

Elected. J. P. St. Aubyn, Wakefield Street, Regent Square, and H. J. Whitling, Berners Street, Oxford Street, as Associates. M. A. L. T. Vaudoyer, Arch., Member of the Institute of France, as an Hon. and Corr. Mem.

Presented. A work on the Caracalla Circus, 2 vols. 8vo; Antiquities of Rome, 2 vols. 8vo. Thou's Restoration of the Palace of the Cæsars. Greece and the Levant, 2 vols. 12mo, by the Rev. R. Burgess. Memoir of M. Durand, Arch., by M. Rondelet. Prints of Christ Church, Doncaster, and St. George's Church, Sheffield; by W. Hurst, Fellow. An Enquiry into the Motive of the Representations on ancient Coins: 8vo; by T. Burgon, Esq. Archœologia, 16 vols. 4to; by the Antiquarian Society. Essay on the Restoration of the Pyramidion to the Pyramids of Luxor; by M. Hittorff. Prints

and Plans of the Goldsmiths' Hall, of the City Club House, of the St. Catherine's Docks, of the Entrance to the London and Birmingham Railway, and of the New Crescent, Dover; from P. Hardwick, Fellow. Essay on the Causes of Dry Rot in Buildings; by J. P. Papworth, V. P. Specimens of Portland Stone, by J. B. Gardner.

Read. Letters from Mr. Rickman of Birmingham, respecting Kyan's Patent; from M. Chateauneuf, H. and C. M., communicating the Particulars of a Competition for the New Exchange, Hamburg (See p. 149.); from M. Gau, H. and C. M., acknowledging the receipt of the *Transactions*, and promising to read Part 3. of Mazon's *Pompeii*; from the Royal Academy of Fine Arts of Berlin, acknowledging the Receipt of a copy of the *Transactions*, and promising to send in return any works which the Academy may publish; and of which the following is an extract: "The position which the Academy holds is somewhat peculiar, as it takes an active part in the direction of every thing relating to the Fine Arts, and of the schools destined to this end, in all the principal places of the kingdom; even of Commerce, whenever any new inventions are produced, or any works susceptible of taste and beauty, they are submitted to its inspection, in order that talent may be encouraged in every quarter, by means of these institutions, which date their origin from the reign of Frederick II. The meetings of the Academy are rather designed to enquire into matters, to grant patents of invention, and to award medals and rewards for the encouragement of the arts. The discourses delivered at the public meetings, which take place twice a year, are printed in the *State Gazette*."

A letter from Seevajee Rajah of Tanjore, Hon. Mem., addressed to Earl de Grey, President, of which the following is an extract:—"In your Lordship's letter a desire is expressed that accounts might be afforded of the several Hindoo temples in the Fortress and province of Tanjore. The sculptures in the Temple of Audiarcoil are particularly recommended to attention. I am not in possession of any written information respecting the temples alluded to, but I shall use my endeavours to procure accounts of them; although I fear these can be but traditionary. I hope, however, to be able soon to transmit to the Institute drawings of some of the sculptures in our sacred buildings, particularly the one at Audiarcoil."

A letter from Col. Maclean, President at the Court of Tanjore, communicating information respecting works executed by Taghirdar Rama Sawney. A paper by the Rev. R. Willis, Hon. Mem., descriptive of a new instrument invented by him, for tracing the profiles of mouldings, and called the *Cymagraph*. A translation, by T. L. Donaldson, Hon. Sec., of the Essay on the Restoration of the Pyramidion to the Pyramid of Luxor, from the French of M. Hittorff. An Introductory Paper by Dr. Dickson on the Physiology, Structure, and Properties of Woods used in Construction.

March 13.—P. F. Robinson, V. P. in the Chair.

Presented. Plans, Elevations, &c., of the Cathedrals of Gloucester, Exeter Durham, Bath Abbey Church, St. Alban's, and St. Stephen's Chapel, Westminster; by J. Carter; folio: from the Antiquarian Society. A Bust of King William IV. from J. Rennie, jun., Esq. Le Cabinet de la Bibliothèque de Ste. Génévière: folio, plates. Observations on a Letter from W. R. Hamilton, Esq., to the Earl of Elgin, on the new Houses of Parliament. View of Charmouth Church. The Churches of London, Part 3.

Read. A Paper by M. Schultz on some Roman Constructions on the Rhine, and on the Roman Mode of mixing Mortar, as described by Vitruvius. A Memoir of M. Durand, Arch., author of the *Parallel*, and of the *Leçons d'Architecture*.